

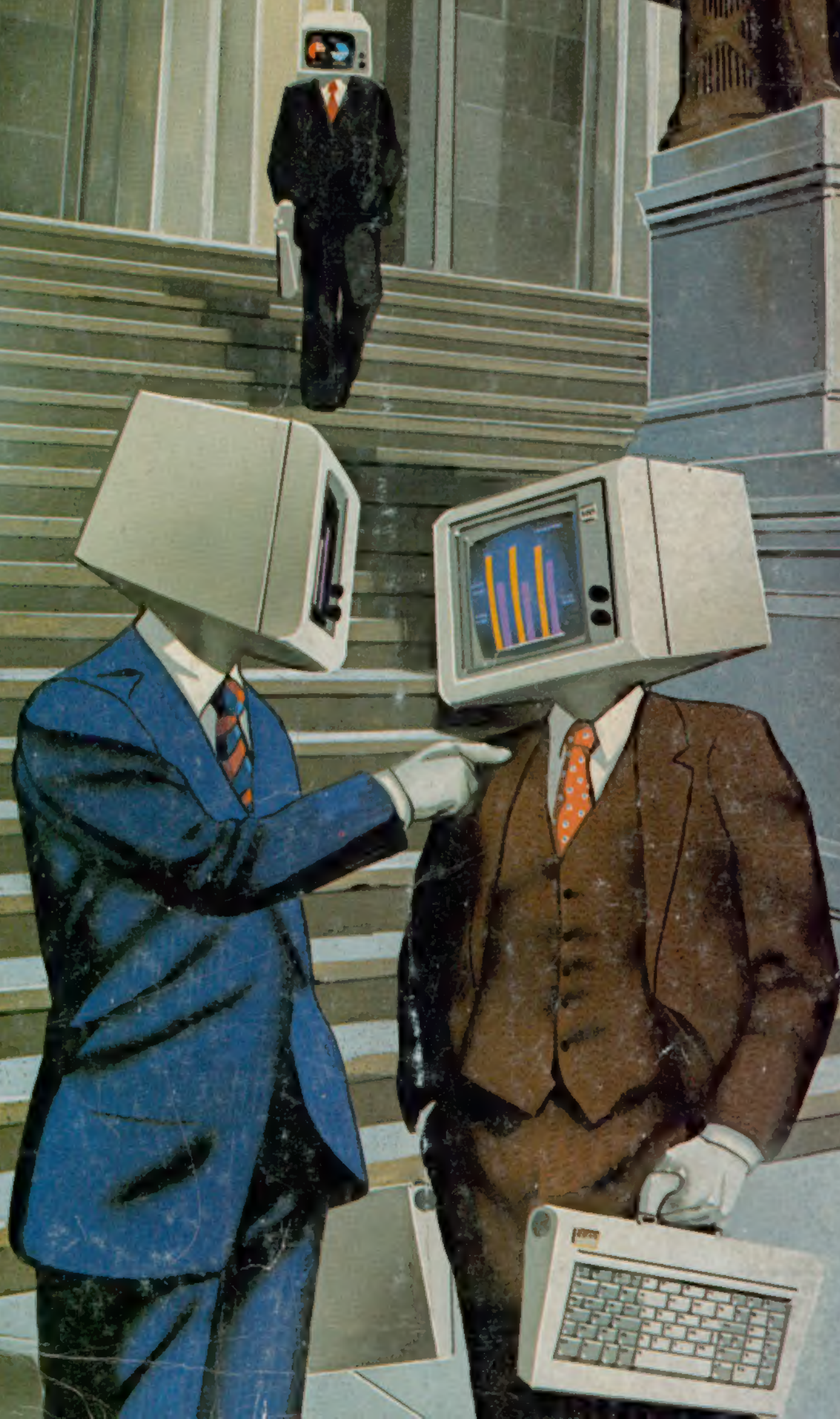
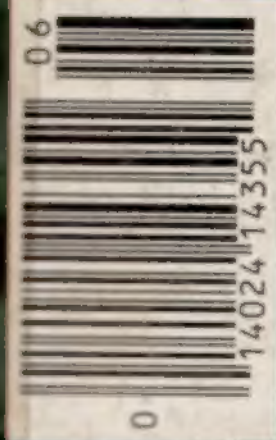
# PC

The Independent Guide to  
IBM Personal Computers

Volume 2 Number 1  
June 1983 \$2.95

## THE PC ON WALL STREET

New WordStars  
Color Monitors  
The Portable  
Computers





History will record as a profound irony  
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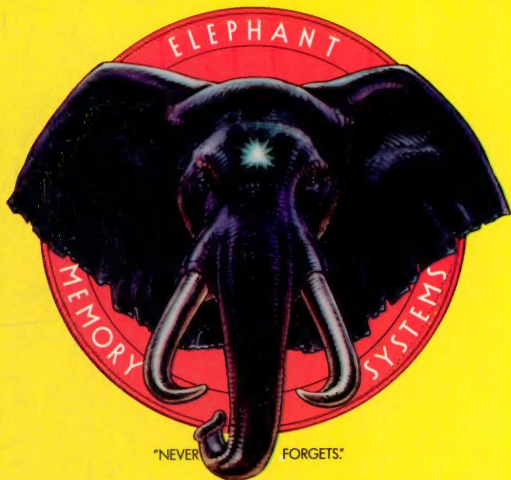
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Says who? Says ANSI.

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They're a group of people representing a large, well-balanced cross section of disciplines—from academia, government agencies, and the computer industry. People from places like IBM, Hewlett-Packard, 3M, Lawrence Livermore Labs, The U.S. Department of Defense, Honeywell and The Association of Computer Programmers and Analysts. In short, it's a bunch of high-caliber nitpickers whose mission, it seems, in order to make better disks for consumers, is also to

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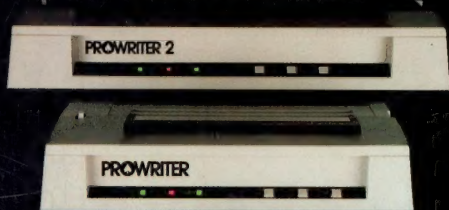
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The Prowriters: business printers—and more. The "more" is a dot-matrix process with more dots. It gives you dense correspondence quality copy (as opposed to business quality copy, which looks like a bad job of spray-painting).

Prowriter: 120 cps, 80 columns dot matrix compressable to 136, 10" carriage. Parallel or serial interface.

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### THE STAR.

The Starwriter F-10. In short (or more precisely, in a sleek 6" high, 30-pound unit), it gives you more of just about everything—except bulk and noise—than any other printer in its price range. It's a 40 cps letter-quality daisy-wheel with a bunch of built-in functions to simplify and speed up word processing.

It plugs into almost any micro on the market, serial or parallel.



### THE MASTER.

The Printmaster F-10. Does all the same good stuff as the Starwriter except, at 55 cps, the Master does it faster.



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# ZERO TO MULTIPLAN™ IN 5.2 MINUTES.

## FINANCE OR ACCOUNTING WORKSHEETS FAST.

**SELLING AND ADMINISTRATIVE: BASIC INFORMATION**

Enter company name: MODERN FURNITURE

Enter product name: BUDGET FURNITURE

Enter Report name: SALES/ADMINISTRATIVE EXPENSES

Enter budget period: 1983

COMMAND: Example Help Load Next Quit Review Save

Enter responses:  
Press Tab to move to command line. Expert System response

**Gentlemen, start your computers.**

**SELLING AND ADMINISTRATIVE: INTERVAL SELECTION**

Monthly

Quarterly

Annually

Other

COMMAND: Example Help Load Next Quit Review Save

Enter responses:  
Press Tab to move to command line. Expert System response

**Select budget intervals.**

**SALES REVENUE**

Enter sales revenue for each quarter

1st Qtr 1983: \$ 250,000

2nd Qtr 1983: \$ 250,000

3rd Qtr 1983: \$ 250,000

4th Qtr 1983: \$ 250,000

COMMAND: Example Help Load Next Quit Review Save

Enter responses:  
Press Tab to move to command line. Expert System response

**Enter sales revenue.**

**VARIABLE SELLING EXPENSES: EXPENSES INCURRED**

Enter desired categories by typing in one category name per line. If suspended responses shown are not wanted, delete them or replace them with your own preferred categories.

Variable Selling Expenses: 1 - Commissions

Variable Selling Expenses: 2 - Other

Variable Selling Expenses: 3 -

Variable Selling Expenses: 4 -

Variable Selling Expenses: 5 -

Variable Selling Expenses: 6 -

Variable Selling Expenses: 7 -

Variable Selling Expenses: 8 -

Variable Selling Expenses: 9 -

Variable Selling Expenses: 10 -

COMMAND: Example Help Load Next Quit Review Save

Enter responses:  
Press Tab to move to command line. Expert System response

**Enter selling expenses.**

**Time: 0**

**Time: 0.5**

**Time: 1.0**

**Time: 1.5**

**FINANCIAL STATEMENT: SALES/ADMINISTRATIVE EXPENSES**

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Total
SALES REVENUE	250,000	250,000	250,000	250,000	1,000,000
VARIABLE SELLING EXPENSES	25,000	25,000	25,000	25,000	100,000
Fixed Selling Expenses	100,000	100,000	100,000	100,000	400,000
TOTAL SELLING EXPENSES	125,000	125,000	125,000	125,000	500,000
ADMINISTRATIVE EXPENSES	25,000	25,000	25,000	25,000	100,000
TOTAL EXPENSES	150,000	150,000	150,000	150,000	600,000
NET INCOME	125,000	125,000	125,000	125,000	500,000

COMMAND: Example Help Load Next Quit Review Save

Enter responses:  
Press Tab to move to command line. Expert System response

**Your sales budget on the Multiplan electronic worksheet-in record time.**

**Time: 5.2**

and build financial or accounting worksheets tailored to your specific needs. In minutes.

You won't have to worry about developing formulas or formatting screens to build your Multiplan worksheets. Because the expert systems literally do it for you.

For example, the Multi-Tool Budget expert system creates seven inter-related

Multiplan worksheets for a total budget planning and control environment.

What's more, each system is developed by experts: business professionals and leading authorities in finance and accounting.

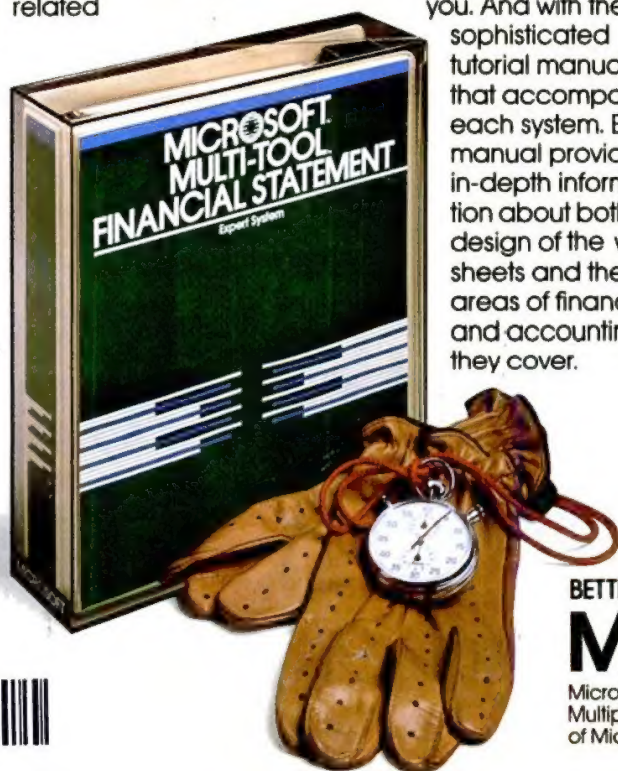
You'll benefit from their knowledge immediately, through the powerful worksheets each Multi-Tool expert system builds for you. And with the sophisticated tutorial manuals that accompany each system. Each manual provides in-depth information about both the design of the worksheets and the areas of finance and accounting they cover.

The result: a tailored electronic worksheet that helps you make high quality decisions.

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**THE MULTI-TOOL EXPERT SYSTEMS. A POWERFUL ADDITION TO THE MULTIPLAN ELECTRONIC WORKSHEET.** Available now: The Multi-Tool Budget expert system. The Multi-Tool Financial Statement expert system.



This One



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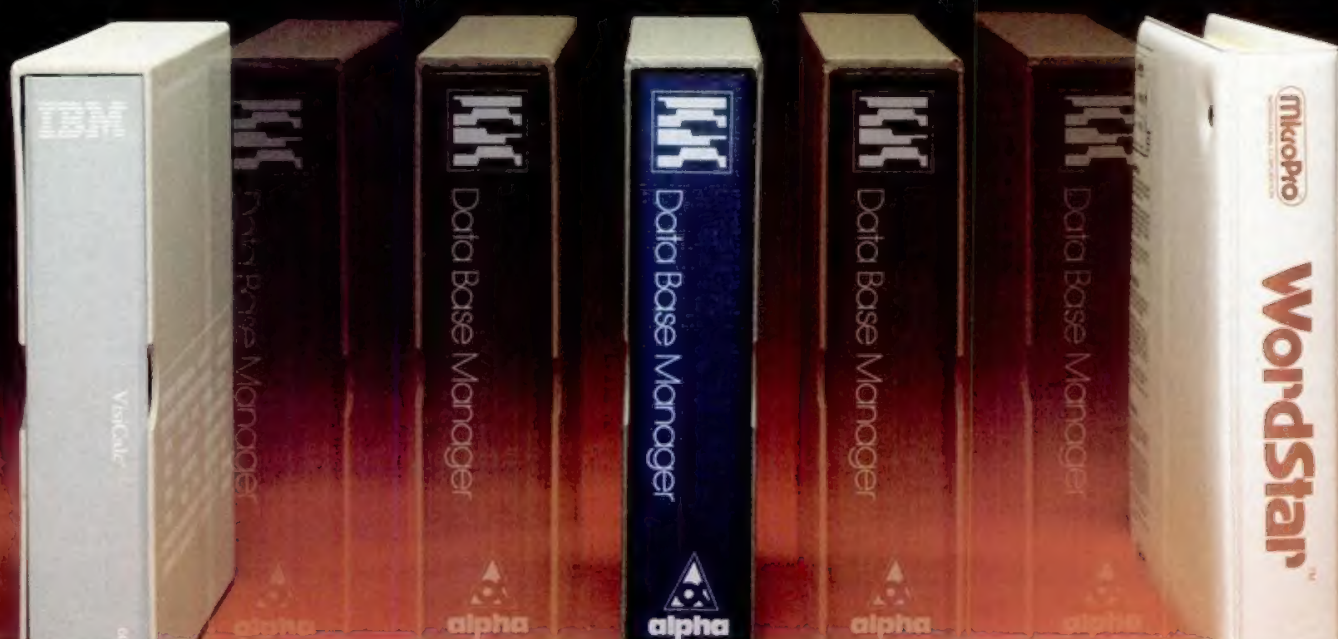
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If you already own VisiCalc or Wordstar, and want a truly integrated system, then Data Base Manager II is for you. You get the full power of VisiCalc, Wordstar, and Data Base Manager II, with no new commands to learn and no compromises. With this integrated system, you only enter data once.

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From a Data Base Manager II Record  
(that you sort or search for):

A	B
1 FIRST NAME	ROGER
2 LAST NAME	SMITH
3 BALANCE	3261
4 PAST DUE	30
5 CALCULATED INTEREST	
6 AT 1.5% / MO	
7 IS	48.92

Go to VisiCalc and  
Calculate Interest Charges

RECORD NUMBER 7	
1 FIRST NAME	ROGER
2 LAST NAME	SMITH
3 BALANCE	3261
4 PAST DUE	30

Dear Mr. Smith:  
Your interest fee is \$48.92.  
Please remit this amount immediate  
Your timeliness will be much apprec

Finally, go to Wordstar  
and Automatically Mailmerge  
a Customized message

Introducing Data Base Manager II – a powerful, yet easy to use software product. It interfaces effortlessly with VisiCalc and Wordstar in just a few keystrokes. Howard Herbin, Computerland of Niles, Illinois says: "Alpha's Data Base Manager II is the first I have seen which is 100% VisiCalc and Wordstar compatible – it is truly useful."

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- ☐ **Benchmark**

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- ☐ **MS-DOS**

### Financial Planning

- ☐ **Multiplan**
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- ☐ **VisiCalc**
- ☐ **Microplan**
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- ☐ **PeachCalc**

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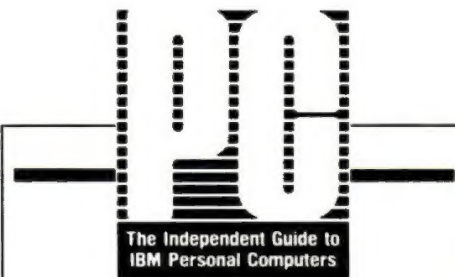
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**CIRCLE 116 ON READER SERVICE CARD**



The Independent Guide to  
IBM Personal Computers

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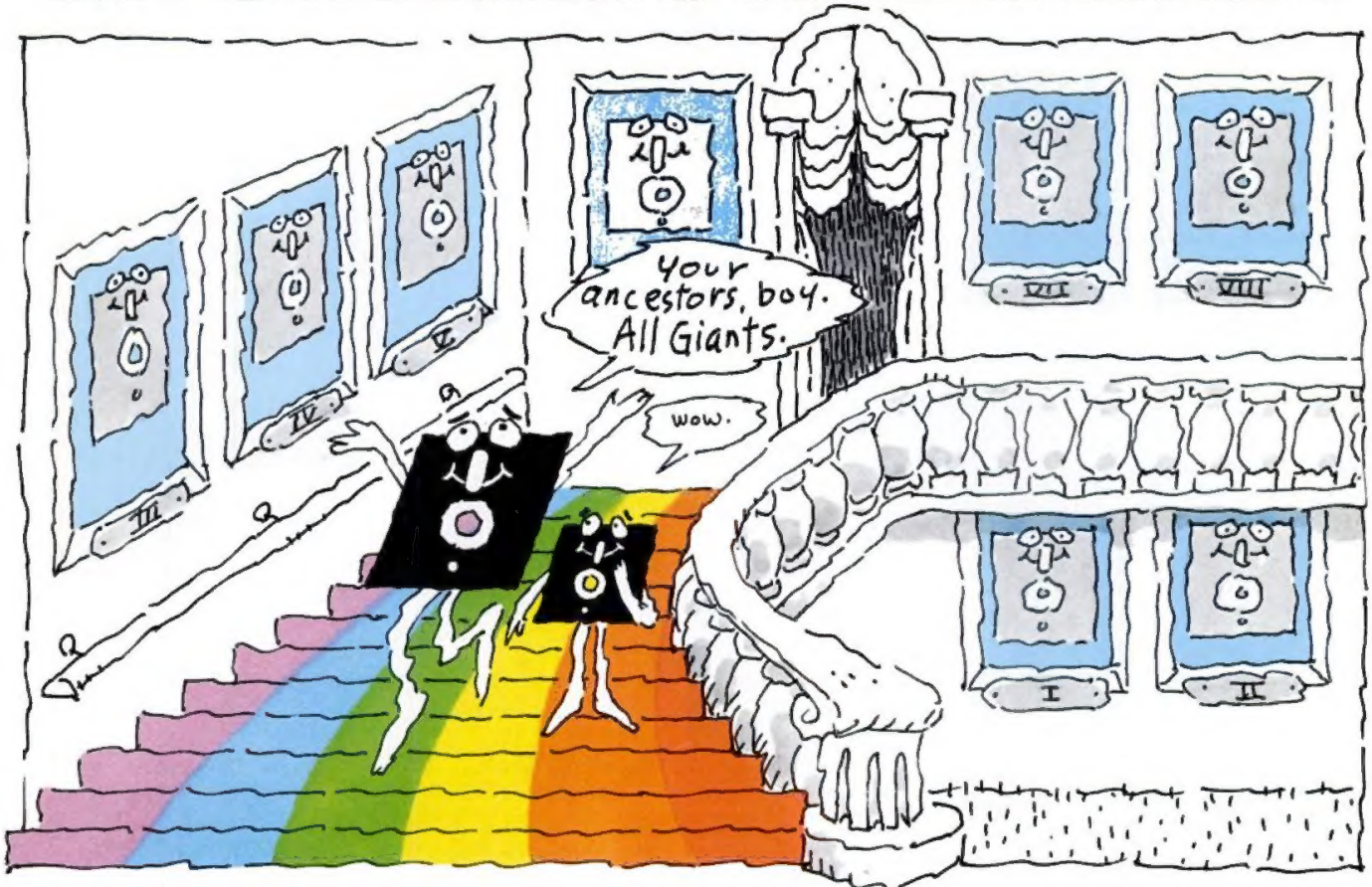
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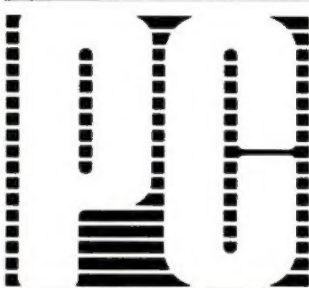
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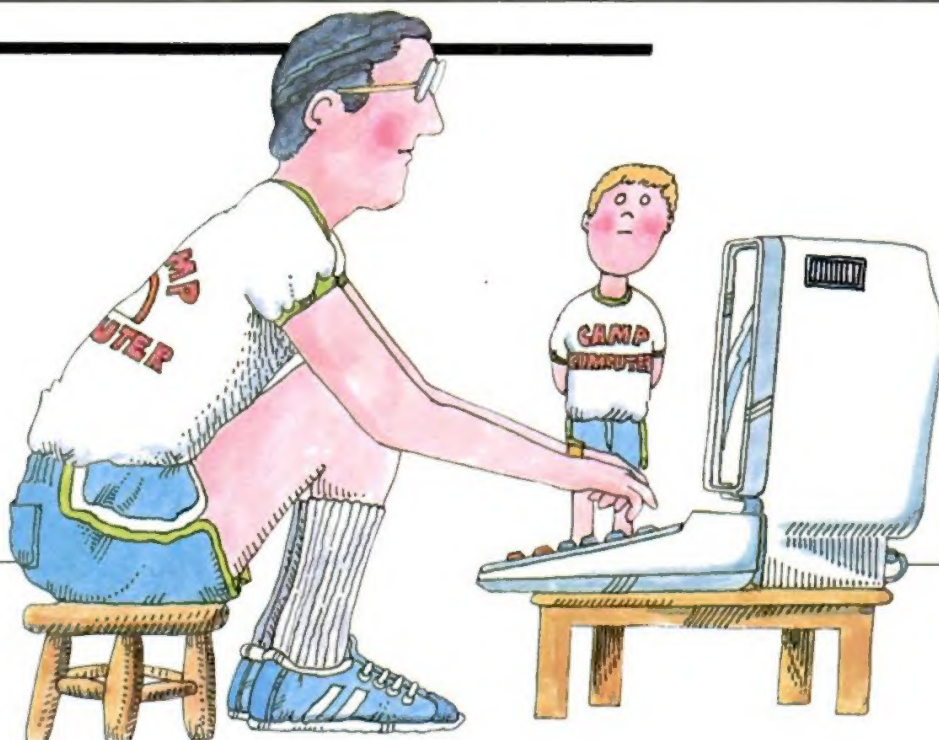
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The Independent Guide to  
IBM Personal Computers

Volume 2 Number 1



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This is Volume 2 Number 1—the June issue—of PC Magazine. It follows Volume 1 Number 12, the April issue. There was no issue of PC designated as "May." PC has not skipped an issue, however. The month designation has been changed simply to correct an inherited late production schedule.

You will now receive PC at the beginning of the month of issue rather than late in the month. This change does not otherwise affect your subscription. For example, you have a 1-year subscription to PC, you will receive 12 issues, one each month.



**Compaq: Getting There 186****Isn't Half The Fun/Corey Sandler**

This PC work-alike is fairly portable.

**Two Computerized 294****Draftsmen/Winn L. Rosch**

Plotters that move both pen and paper.

**The TRS-80 Model 194****100: Never An Idle Moment/Corey Sandler**

It's so portable, who cares if it's not compatible?

**High-Resolution Color 247****Monitors/Winn L. Rosch**

Pay attention to what's behind the screen.

**A Sampling Of RGB 251****Monitors/Lisa Kleimann and Grace Nagiecka**

This chart compares 11 manufacturers' monitors.

**Columbia: Call It 447****A "Work-Alike"/Corey Sandler**

In some ways it offers more for less.

**SIGHT AND SOUND****Computing in 350****3-D/Barbara Luke Solsky**

The Space Tablet brings the 3-D world into your PC.

**"Testing 1 2 3" 465****With The PC/John Woram**

A program for the recording studio.

**WORD PROCESSING****WordStar 3.24 And 391****3.3: MicroPro Does It Again****... And Again/Stephen Manes**

Are these updates worth the price?

**Fast Recovery From 411****WordStar Disaster/Randy****Bennett and Roger Kershaw**

Lost files might be as nearby as the RAM.

**PROGRAMMING****Defining Function Keys 423****With PC-DOS 2.0/Kenneth****Wood**

Your choice of commands and strings one keystroke away.

**PC ARCADE****Terminal Jet 457****Lag/Corey Sandler**

Three flights of fancy for the PC.

**MARKETPLACE****How To Choose A 552****Computer Camp/Leslie Wines**

For children and adults, with a list of camps.

**BOOK EXCERPT****IBM PC Graphics 611****Primer, Part II/Mitchell Waite and Christopher L. Morgan**

How to program graphics designs.

**DEPARTMENTS****From The Editor's 31****Screen/Corey Sandler****Letters To PC 39****PC-Communiqués 59****PC Tutor/Mark 63****Zachmann****PC: Blue Book 510****User-To-User/Bill 569****Machrone****Perspective/Will Fastie 574****New On The Market 578****Club News/Susan 602****Hurley****PC: Mart 615****Index To Advertisers 632****Coming Up 635****COVER**

Illustration by Marc Ericksen.



# It took hundreds of years to build the world's most advanced spreadsheet.

Way back in 1534, a Venetian scholar wrote a text that standardized the techniques of modern bookkeeping. And up till 1979, there weren't a lot of real improvements in the way people did spreadsheets. You still had to enter all your figures by hand. Run all the totals yourself. And when you had to make a few changes, you had to run the totals all over again.

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SuperCalc².

**1981**

**1534**

1540 Adi ultimo Feb

194	P	Pro et danno // A donarij, per da tratto in resto, per saldo di quello di
195	P	Pro et danno // A Spese de unuer di spese fatte, come in esse appar, per saldo 1548 20 P 14
196	P	Fatti della possessione da Moian // A per fito di quella per l'anno presente, 1541 per saldo de quelli di 45 8
197	P	Pro et danno // A Spese diuerse per l'anno presente, come in esse appar, per 399 8 12 P
198	P	Pro et danno // A Spese de salariabti piu spese fatte l'anno presente, come in per saldo de quelli di 48 8 12 P
199	P	Pro de zeccha in monte // A Pro et d lita seguida, come in quello appar, per 150 8 P
200	P	Pro et danno // A Cauedal de mi Alun per ultima seguida de l'anno 1549 1

**1979**

STATEMENT			
	JAN 1980	FEB 1980	MAR 1980
SALES	1000	1100	1200
COST	300	330	360
GROSS	700	770	840
R & D	160	176	192
MARKETING	200	224	240
ADMIN.	140	151	162
TOTAL	500	551	600
INCOME	200	219	240
TAXES	80	88	96
NET	120	131	144

INCOME STATEMENT

1	NET SALES	JA 1000
2		
3	COST OF GOODS SOLD	300
4		
5	GROSS PROFIT	700
6		
7	RESEARCH & DEVELOPMENT	160
8	MARKETING	200
9	ADMINISTRATIVE	140
10		
11	TOTAL OPERATING EXPENSES	500
12		
13	INCOME BEFORE TAXES	200
14		
15	INCOME TAXES	80
16		
17	NET INCOME	120
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# It'll take you 10 minutes to learn it.

10 minutes to SuperCalc<sup>2</sup>

Create your first spreadsheet model in 10 minutes flat.

With SuperCalc<sup>2</sup> you get all kinds of features that have never been possible before. Like custom formatting capabilities. Automatic consolidation. Sorting. And more. Take a look at the spreadsheet below, and you'll see just how much we're giving you.

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1983

Combines any number of spreadsheets —automatically!

Calendar/date capabilities.

Percentages.

## COMPANY CONSOLIDATED MONTHLY PAYROLL

Today's Date	4/15/83	Deduction Percentages
Payroll Start Date	4/ 1/83	Fica 6.700%
Days this period	15	SDI .8%
Recalculate YTD Y/N ?	N	

User-set decimal places.

Emp#	Employee name	Status	Gross Salary	Total Deduct	Net Pay	YTD Gross
34	Adams	M	\$1,100.00 ( \$82.50)	\$1,017.50	\$6,200.00	
49	Beckette	S	\$750.00 ( \$56.25)	\$693.75	\$5,250.00	
84	Johnson	S	\$850.00 ( \$63.75)	\$786.25	\$5,950.00	
92	Jones	M	\$900.00 ( \$67.50)	\$832.50	\$6,300.00	
12	Samson	S	\$560.00 ( \$42.00)	\$518.00	\$3,920.00	
19	Santos	M	\$650.00 ( \$48.75)	\$601.25	\$4,550.00	
45	Smith	S	\$700.00 ( \$52.50)	\$647.50	\$4,900.00	

Total # employees 7 Floating \$ signs.

Embedded commas.

Total Gross Salaries (100's)	\$55.1
Total Deductions (100's)	\$-4.1
Total Net Pay (100's)	\$51.0

Negative numbers in ( ).

Arrange reports numerically or alphabetically, like this

Numbers in 100s or 1000s.

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reason with  
instead of destroy.**





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At Spinnaker, we don't believe in the "kill or be killed" concept behind most computer games. In fact, we believe computer games should be instructive. Not destructive. But just as importantly, they should be fun.

That's why *IN SEARCH OF THE MOST AMAZING THING™* is designed to let your kids negotiate with aliens instead of destroying them. Because given the opportunity, kids enjoy using their minds.

**It's Amazingly Fun.**

The Most Amazing Thing is out there somewhere. Finding it won't be easy.

But relax, your kids will have the help of their old uncle Smoke Bailey.

He'll give them a B-liner (sort of a cross between a hot air balloon and a dune buggy) to use on their journey. They'll have to learn how to fly the B-liner and navigate it through storms and fog. But before they do

anything, your kids will have to talk to Old Smoke. He'll tell them about the Mire People and the strange language that they speak. He'll also tell them to avoid the dangerous Mire Crabs and how to get fuel for the B-liner.

Your kids will visit the Metalican Auction where they'll trade with the aliens for valuable chips. Your kids will then use these chips to buy things they'll need for their trip. And your kids will learn how to fly over the planet using their jet pack.

The Most Amazing Thing holds great powers, but it will take great skill, persistence and imagination to find it.

**It's Amazingly Educational.**  
*IN SEARCH OF THE MOST AMAZING THING* is written by Tom Snyder, educator and author of the best-selling *Snooper Troops™* Detective Series.

And like all Spinnaker games, *IN SEARCH OF THE MOST AMAZING THING* has real educational value. For instance, your kids will sharpen their ability to estimate distances and

quantities. And since they'll be navigating their B-liner, they'll become aware of distance, direction and time. They'll also develop a knack for economic and monetary principles through trading with the aliens. And they'll solve problems through trial and error.

They'll learn all of these things, plus they'll learn that nothing is impossible if you put your mind to it.

**A Novel Approach to Computer Games.**

Besides offering your children all of the above, *IN SEARCH OF THE MOST AMAZING THING* gives them an opportunity to develop their reading skills. Because included with the game is Jim Morrow's new novel *The Adventures of Smoke Bailey.\** So your children will have hours of fun reading the book or playing the game. And they'll be learning at the same time.

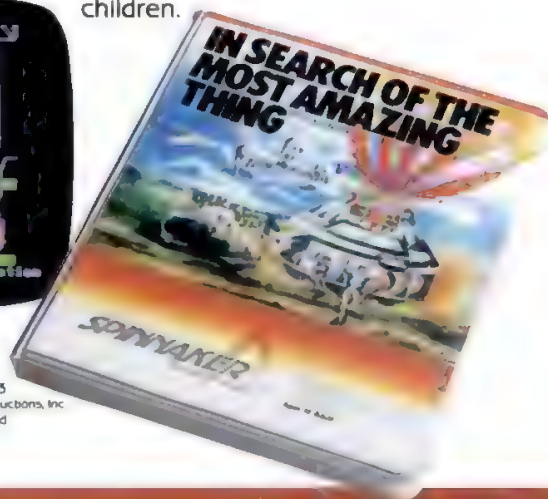
**Parental Discretion Advised.**

If you're a parent who would rather see your kids reason with aliens than destroy them, you've got plenty of reasons to ask your local software retailer for *IN SEARCH OF THE MOST AMAZING THING*. It's compatible with Apple,\* IBM,\* Atari,\* and Commodore 64™ computers. And it offers so much fun you'll probably be tempted to play it yourself. Or you can write us directly at: Spinnaker Software, 215 First Street, Cambridge, MA 02142.

You'll find this is one computer game that won't alienate you from your children.



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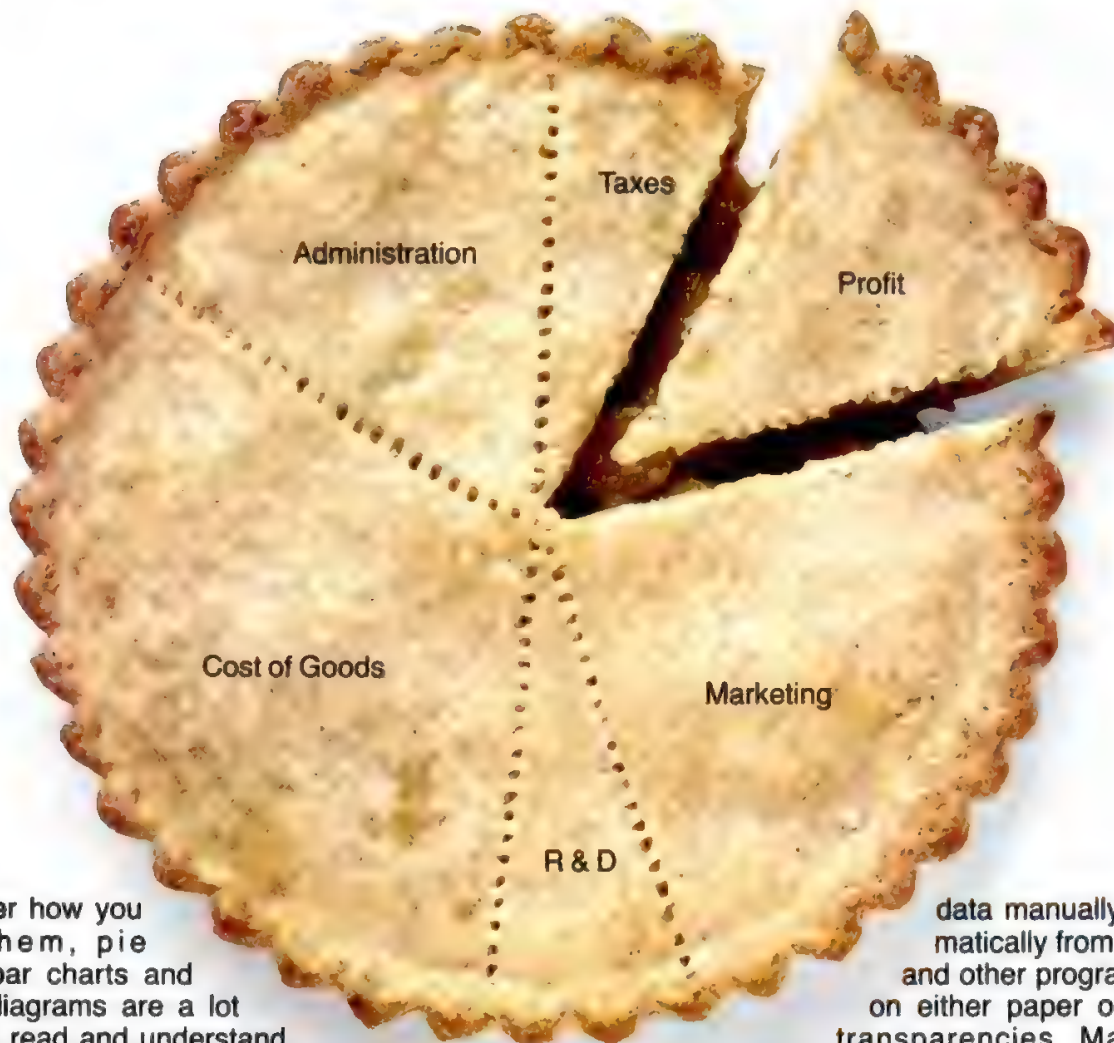
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### **Virtual Memory**

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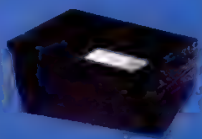


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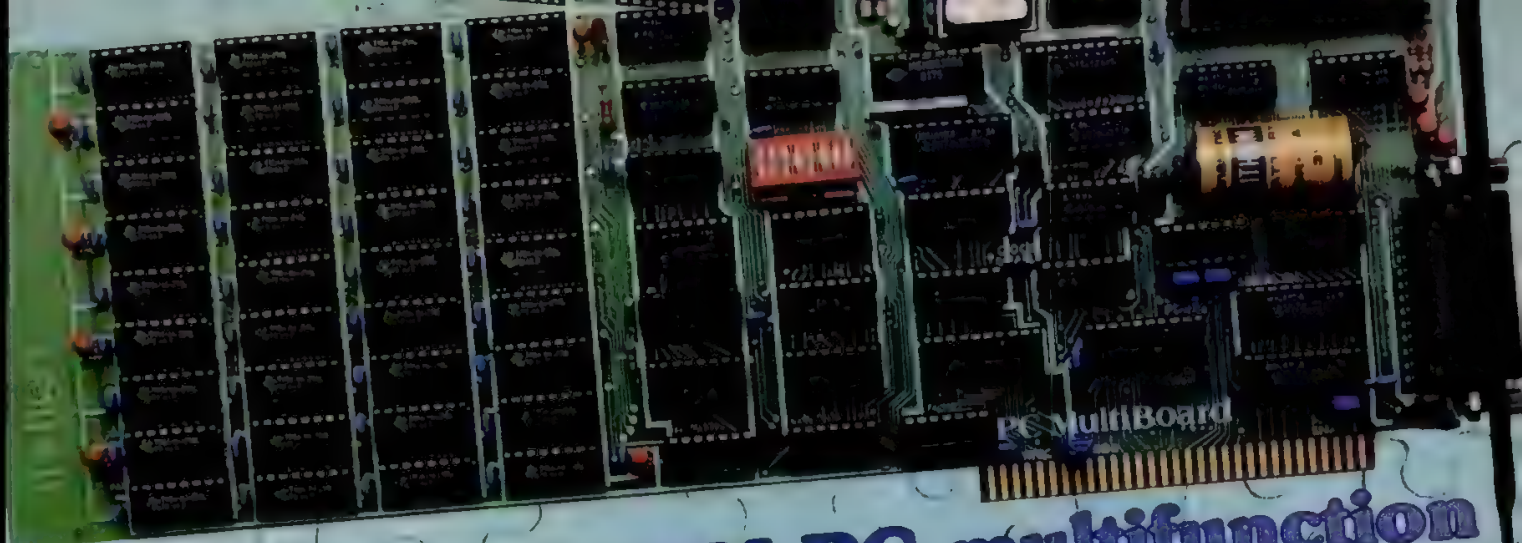
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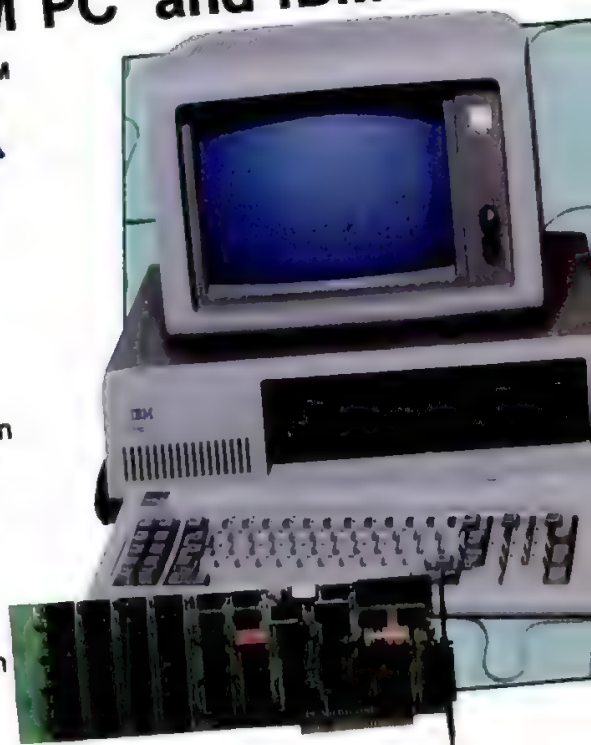
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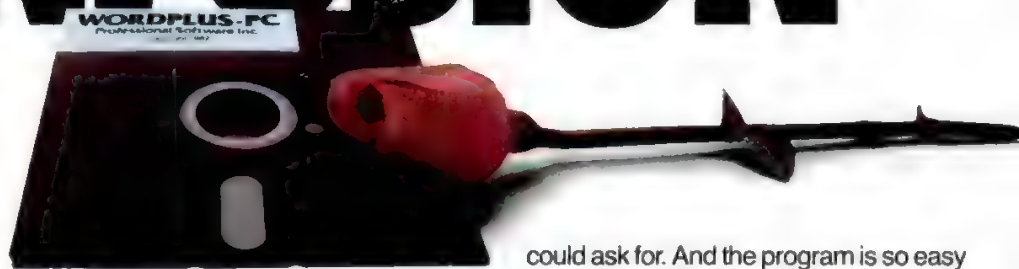
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# ANNOUNCING THE END OF WORD PROCESSOR CONFUSION



It's one confusing business, choosing a word processor. All those companies assuring you theirs is the most fantastic one of all. And leaving you to cut through all the smoke and hopefully whittle them down to the best one for you.

Well, we can help. If you'll just invest the next three minutes reading this, we'll tell you about a word processor that makes picking the right one a real breeze.

**FIRST, A WARNING.** There are two things you must do when evaluating any word processor. First, be careful. It's no secret that many of today's claims about being easy to learn and use just don't stand up to careful comparison. Watch carefully for complicated codes and programs that require "training sessions." Secondly, be selective. Buy a word processor you can use on a daily basis, not one that requires another "training session" when someone goes on vacation. In other words, be very careful to select

the word processor that's absolutely the best and easiest to use. Which is what we'll now introduce you to.

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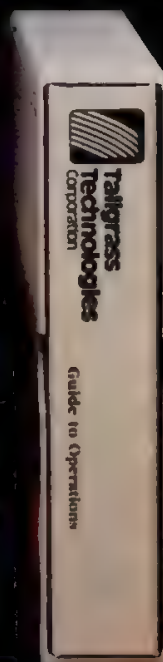
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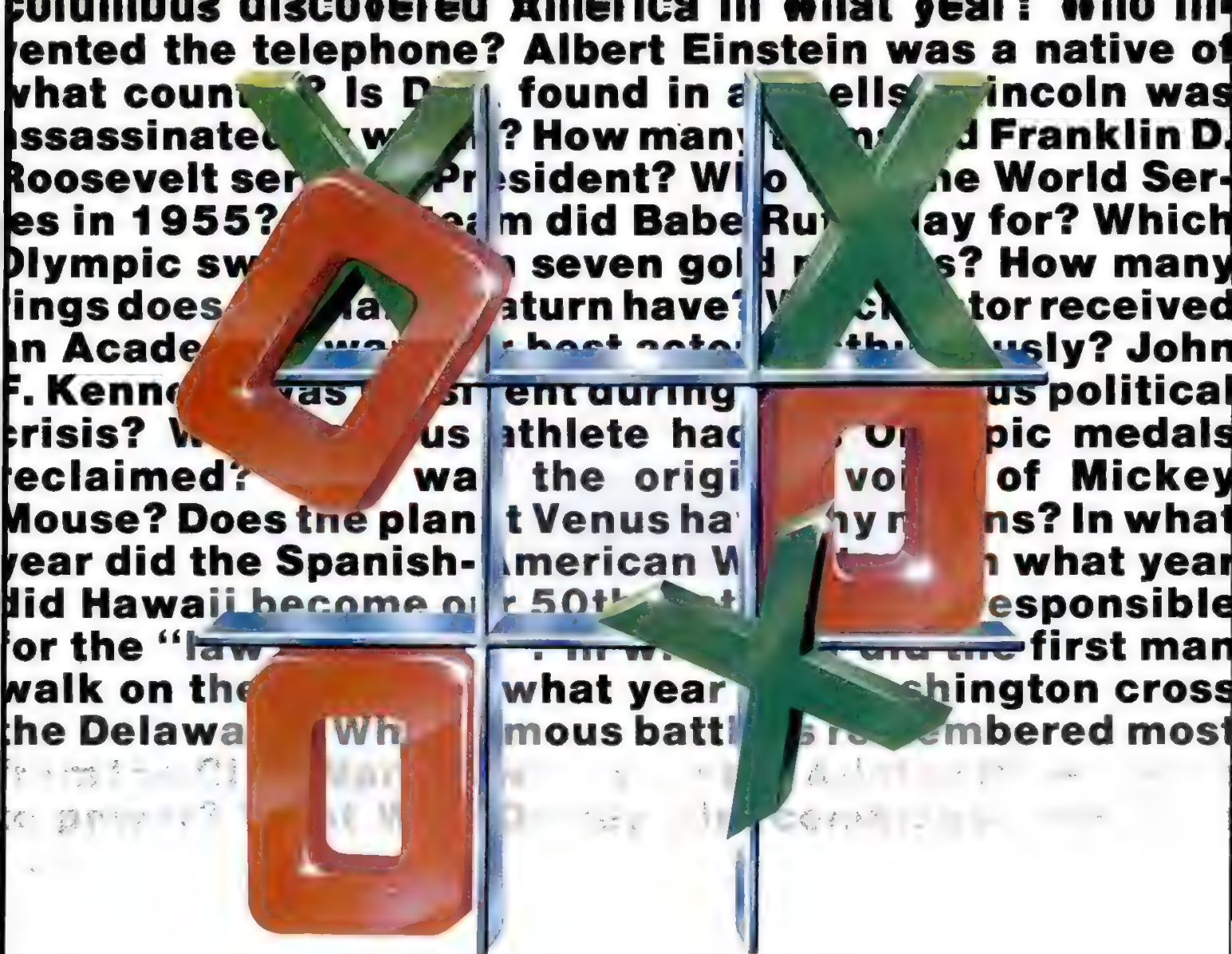
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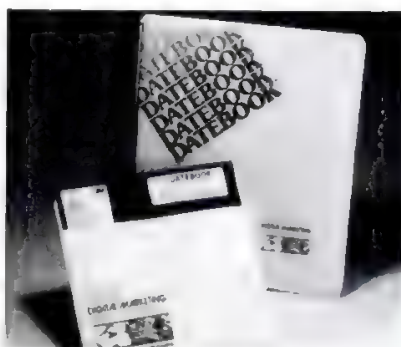
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*In the early days of radio, lonely announcers wondered who their listeners were, and what they thought of the show. The medium is different, but nothing has changed.*

# Getting To Know You

Welcome to Page 31 of PC Magazine. You've no doubt worked up a good head of steam already, having made your way through about 4.9 percent of this monthly Brobdingnagian tome. If our calculations are correct, this means that you are roughly 7.7 minutes into an expedition of 3.9 hours. We really appreciate the time you have taken for this purpose, especially since that time is worth about \$113.99, before taxes, based on your family's median income.

Of course we know that PC Magazine is very important to you—both at work and at home. In fact, for about 67 percent of you, home is where you hang your microcomputer. However, work presents no escape from the digital demands of home and hearth, for 47 percent of you have an IBM PC at the office. (A little more than 10 percent reported other brands as a primary or secondary machine.)

I'm 94 percent sure that 87.3 out of a hundred of you have guessed by now that we've begun digesting the results of a survey of some of our subscribers. These polls are conducted primarily for the benefit of our ad sales staff, so that they can convince advertisers of the worthiness of an investment in space in PC. As you may have noticed, they've had some success in this area, as well they should. But the numbers, and the portrait that can be drawn from them, are also closely exam-



**I**T'S NICE TO HAVE  
*some idea of who is out there.*

ined here on the editorial side. It's nice to have some idea of who is out there at the end of the long and laborious process of planning, writing, editing, and designing this magazine.

We now know, for example, that you're a pretty well-educated guy. The survey-

takers inform us that 96 percent of you have been to college, with 82 out of 100 of you owning a sheepskin. Another 40 percent of subscribers to PC have earned graduate degrees, and one out of seven of the survey respondents say they have earned the right to be called "Doctor."



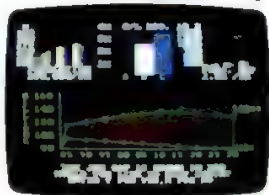
# COLORPLUS™

## Shatters The Mold.



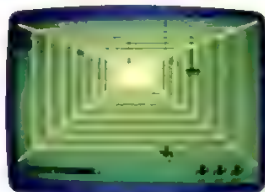
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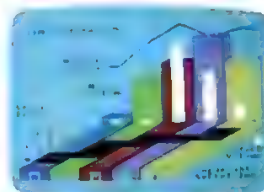
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### Ladies' Home Computer?

Oh, by the way, no offense was meant to our female readers by the use of the word "guy." It's just that our survey-takers didn't run across very many women. The supposedly representative sample of subscribers indicated a readership that's 97 percent male. We have no intention of ignoring the special needs or interests of women though, and we further suspect that there are more women out there than the survey suggests. (Could it be that women are more likely than men to ignore questionnaires? Do men open the mail first? Do women prefer to buy their copies of PC at the newsstand or at a computer store?)

Whatever the case, more and more women are getting into the field of microcomputers, and we believe they'll find PC Magazine to their liking. But while we're on the subject, men, why not make it a point to introduce PC to your male and female co-workers, friends, and relatives.



**THE MOST  
common configuration  
of PC equipment among  
those surveyed is a  
machine with 128K  
RAM and at least three  
plug-in boards.**

We hope they will eventually buy their own subscriptions, but in the meantime they will serve to expand what we know to be the 1.9:1 ratio of readers to each copy of the magazine.

Speaking of basic equipment, we were

informed that the most common configuration of PC equipment among those surveyed is a machine with 128K RAM and at least three plug-in boards, which should bring comfort and hope to the manufacturers of add-ons. Dot matrix printers overwhelmed letter quality printers in home uses (72 percent versus 9 percent); at the office the dot matrix was present in 80 percent of the situations, a letter quality printer in 28 percent. More than a quarter of all subscribers responding said they used a color monitor with their PCs.

BASIC is definitely the language of choice, winning 88 percent of home market and 77 percent of business applications. And the battle of the operating systems? PC-DOS wins hands-down in this survey: 93 percent in the home and 91 percent in the office. The UCSD p-system and CP/M-86 were in the low single digits in both situations.

Now, slave though we do over every word and article of punctuation in PC, we are also aware of how important the advertisements are to our readers. We were told that eight out of ten subscribers read most every ad in PC. And 44 percent reported buying a product they learned about from an advertisement. But it doesn't stop with your personal purchases: 85 percent said they had recently advised a friend on the purchase of microcomputer equipment and nearly two-thirds had offered advice to business associates or their employers. I trust you are keeping track of your commission checks.

Oh well, it is time to release you from this page and let you continue your travel through these pages. Please be sure to say hello for us to your 1.249 children under the age of 19, your .837 of a car, your 1.67 television sets, your. . . .

In this issue, we venture for the first time beyond the Blue horizon and into the realm of the PC "clones." We do so with great care, for it is our intention to focus on the personal computer products of IBM and those competitive machines that are truly interchangeable. We look with automatic skepticism upon advertised claims of "PC Compatibility"—claims that have made their way unquestioned into the columns of other magazines.

A first point: No machine can be a true clone, for this would by definition infringe upon IBM's patents and copy-



**WE LOOK  
with automatic  
skepticism upon  
advertised claims of  
"PC Compatibility."**

rights. So the search is actually for the most perfect first cousin.

From this seat, I can see three principal categories of compatibility. First are "PC Look-Alikes." These are low, wide boxes with black disk drives, a row of cooling slots on the left side, a detached keyboard and monitor, and probably a cream, gray, and black color scheme like the PC's. But don't try and run a PC-DOS program or read a PC-DOS data disk. Inside the box may well be a Z-80 or a 68000 or a 6502 or some other alien microprocessor.

Next category would be "PC Run-Alikes." This type of machine may or may not look like an IBM PC, but inside is an 8088 (or an adapted 8086) microprocessor, which opens the door to kinship. However, Run-Alikes do not automatically accept any and all software or data produced for or by an IBM PC. Programs may need extensive adaptation. Or, they may be able to read a PC-DOS data disk, but not perform any operations upon it. There is also a class of run-alikes that use different-size disk drives.

And finally, the "PC Work-Alikes." To achieve this first cousin status, a computer must accommodate the user who takes a disk from an IBM PC, walks across the room, and plugs it into the "foreign" machine. We shall award the title "clone" only to those micros that meet this rigorous standard.

Caveat abacorum emptor.\*

—Corey Sandler.



CRYSTAL UNIFORMITY  
ADVANCED BINDER  
REFINED LUBRICANT  
IMPROVED JACKET  
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The refinements of The Gold Standard, from oxide particles to lubricant to jacket, are uniquely Maxell. And therefore, so are the benefits.

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CIRCLE 531 ON READER SERVICE CARD



**IBM<sup>®</sup> PC Owners . . .**

**First we solved your printer problems**

**Now we give you**

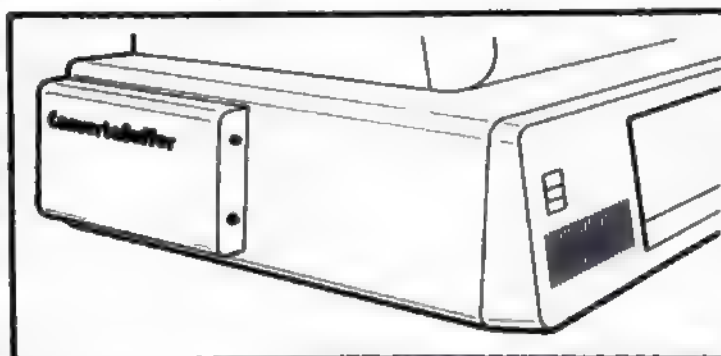
**graphics**

# ConvertaBuffer<sup>™</sup>

**IT'S A CONVERTER.** There was a time when buying a letter quality printer meant giving up graphics. Now, however, ConvertaBuffer<sup>™</sup> gives you the best of both worlds by allowing you to print the business graphs generated by programs such as MBA and 1-2-3 on letter quality printers such as Diablo and NEC. And, the quality of these graphs are as good as those drawn by dot matrix printers such as the IBM/Epson. ConvertaBuffer translates the Epson-format graphics data output from MBA, 1-2-3, and other packages with graphics capability into the format necessary for printing on a letter quality printer.

**IT'S A BUFFER.** Generating graphics requires the outputting of a large amount of data to the printer. ConvertaBuffer speeds this process by receiving the data as fast as your PC can send it — 1,000 characters per second; storing up to 64K bytes of data in its built-in memory buffer; and then sending it to the printer at the printer's slower speed — 25 to 55 characters per second. This allows you to go on to other work without having to wait for the printer to finish printing.

**EASY TO INSTALL.** ConvertaBuffer comes with its own built-in cables which plug directly into your PC's printer adaptor and your printer's cable without removing the cover of the system unit — there is no need to buy an extra cable. And, each unit has its own fully regulated DC power supply — the unit does not steal power from the PC or the printer.



ConvertaBuffer also features a convenient front panel switch which resets the buffer to abort the printer output if desired. And, the status light indicates when ConvertaBuffer automatically switches to the graphics mode.

**HAVE YOUR CAKE AND EAT IT TOO!** The parallel-to-parallel ConvertaBuffer for graphics is the latest member of the ConvertaBuffer family. The original ConvertaBuffer enables you to connect any RS-232C serial interface equipped printer directly into the parallel printer port of your PC with up to 32K bytes of printer buffering.

Ask your dealer about ConvertaBuffer for graphics and the original ConvertaBuffer. Or contact us.

**von Leivendyke**

ENTERPRISES

Silvermine Avenue

Norwalk, Connecticut 06850

203-846-4973

Please send me further information on ☐ graphics ☐ original ConvertaBuffer.

I have a \_\_\_\_\_ printer, with ☐ parallel ☐ serial interface.

Name \_\_\_\_\_ Phone ( ) \_\_\_\_\_

Street Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ ZIP \_\_\_\_\_

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MBA is a trademark of Context Management Systems  
Diablo is a trademark of the Xerox Corp.

1-2-3 is a trademark of Lotus Development Corp  
Epson is a trademark of Epson America, Inc.  
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CIRCLE 469 ON READER SERVICE CARD



# CRU

**The inventor of VisiCalc®, the world's leading software product, introduces TK!Solver™—the revolutionary way to crunch problems on a personal computer.**

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What's so revolutionary about that?

Simply this: the power of the TK!Solver program comes from the ease with which you can set up problems, vary assumptions, find solutions, and display results. All the facilities needed to solve the problems—simple or complex—are built-in, and need not be developed. Once you have stated your problem, simply enter the known values, then solve the problem with a single keystroke.

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CIRCLE 454 ON READER SERVICE CARD



# NOH!

solving common problems in such areas as finance, engineering and education have already been formulated by professionals in these fields.

There is no software product in existence that solves problems as quickly, flexibly, and easily as TK!Solver—The Problem Cruncher.™ In fact, no



other software product even works the way TK!Solver does. It is a necessity for personal computer owners.

See for yourself. Visit your nearest computer store for a demonstration and find out how much you can do with a personal computer when it thinks as flexibly as you do.

**Software Arts™**

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# Add color. simple.

## SOFTWARE FOR BUSINESS by ColorCorp

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C-Delete Items  
D-Transactions  
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M-Over/Understock  
N-Stock Status  
O-Physical Inv.

### Highlights

F-Find & Display  
G-Bar Charts  
H-Report Generate  
I-Directions OFF  
J-Demo Data OFF

### System Functions

P-Change Password  
Q-Set Soft Keys  
R-File Backups  
S-Assign Files  
T-Change Date

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## Add color to your business with ColorBIZ

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Provides usage & margin analysis  
by month & year-to-date

Defined reports include:  
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Recommendation  
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Inventory Analysis  
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# Letters To PC

## Calling All dBASE-ers

In response to the "Calling All Readers" plea from Peter L. Boehme (Letters to PC, Volume 1 Number 9) there does exist a dBASE Users Group in San Francisco. The group can be contacted at (415) 474-6693.

Boehme is also invited to contact the Teacher Education and Computer Center (TECC), which intends to provide training on the IBM PC and which will be using dBASE II to organize its operations. Please note that TECC is looking for good instructors familiar with the PC and the K-12 classroom to offer courses in word processing, spreadsheet programs, and programming in Pascal. TECC can be reached at (415) 881-6218.

This kind of human resource networking could be an ongoing service of PC. You are already doing a terrific job in many other areas.

Lynell Burmark  
Hayward, California

Thanks for helping us fulfill Peter Boehme's request. We are always happy to pass along information to our readers.—Ed.

## End-Users, Unite!

Your magazine has become a respected source of information for PC users and potential users. I have a suggestion to make it even better.

Include a listing of consumer advocacy groups to help harried computer buyers find avenues for recourse when they encounter unresponsive vendors or manufacturers. The computer industry is in a state of flux; all too often the end-user is lost in a melee for profits and general confusion over new technology. It seems likely that true support and accountability in the industry will only be achieved through consumer activist tactics.

You would do a great service to the industry and end-users by occasionally printing a list of computer consumer

protection agencies (if they exist) or suggestions about how to start such a group. If the industry knows that consumer "watchdogs" are monitoring its performance, perhaps when we call for help we'll no longer hear that noxious ques-



tion, "Are you a dealer or an end-user?" (with its inevitable follow-up, "If you're an end-user, call your dealer"—as if we haven't already tried!)

Consumers should be entitled to an honest effort on the part of dealers and manufacturers at resolving problems with computer products.

Helen Harvey  
Oakland, California

We're planning a consumer issue for Volume 2 Number 2, and we'll be glad to consider your suggestion.—Ed.

## For the Record

Your readers deserve better information than what was provided by "Five Financial Programs for the Home" (Volume 1 Number 10). To set the record straight, Money Maestro:

1) provides up to 200 payees and/or categories on a 64K system. These files

are completely configurable by the user. Each of the categories can have up to seven attributes.

2) allocates eight transactions per 1K. On a typical 160K data disk, 1,280-transactions.

3) does allow split transactions.

4) does permit "what if" and forecasting in its budgeting feature.

5) produces files in BASIC Sequential Format, with examples for uses provided in the manual.

6) has a "practice" feature that helps the user gain mastery by running the program on sample data files.

7) has batch processing capabilities by means of its Stockpiling feature.

InnoSys intends that you don't have to be an accountant or a programmer to use Money Maestro; maybe that's why there are so many satisfied users.

Joseph Mancini  
InnoSys Incorporated  
Berkeley, California

## Software for Students

I am planning to purchase a microcomputer for student use in my tutoring business. Can you provide me with information about educational software? I have purchased several issues of PC and have written to several software distributors, but I'm unable to locate anything but a few math games.

Margene Tadd  
Heber City, Utah

Take a look at "Educational Software for the PC," Volume 1 Number 8, and for background, "The Blossoming of Computer-Aided Instruction," Volume 1 Number 12.—Ed.

## Wish Fulfillment

We were delighted to find one of the features of our BASIC Development System (BDS) product in your "Wish List" (Volume 1 Number 10).

Single Step Trace pauses before executing each new line and waits for key-



# Letters To PC

board input to continue. The line number is placed in the upper-right corner of the screen so it doesn't interfere with program displays. You may break out of this trace mode at any time to examine variables, then continue tracing. This makes it easy to follow the program logic and catch those hard-to-find bugs.

BDS also provides a long list of additional BASIC language programming tools. For more information, write to SoftTool Systems, 8972 East Hampden Avenue, Suite 179, Denver, CO 80231.

Ken Snapp  
President, SoftTool Systems  
Denver, Colorado

A contributor to the "Wish List" in Volume 1 Number 10 asked for an adapter plug to connect non-IBM monitors to the PC system unit. Dynalysis has a new product that does exactly that.

The monitor conversion cord allows the user to turn on a non-IBM monitor with the main computer power switch. It adapts any non-IBM monitor or TV set to the PC system unit. The conversion cord can accept any standard two or three prong plug.

The conversion cord is available through the Iron Interface Group, a division of Dynalysis Corporation, 3938 Meadow Brook Road, Minneapolis, MN 55426.

Jim Shultis  
Advertising Communications Inc.  
Bloomington, Minnesota

## Cleaning Up After WordStar

Volume 1 Number 10 contained several letters from readers who have gone through the same frustrating experiences with WordStar as I have. MicroPro would not give me any information over the phone, either. As a result, my company has stopped using WordStar; it was costing us too much time and money in phone calls.

It is our new policy not to get too

firmly entrenched in one company's product without an alternative. We now use Edix and Wordix for our word processing needs because they are easy to use (unlike WordStar's cryptic Ctrl key sequence) and the manufacturer will talk to me on the phone if I have a problem.

Unfortunately, when we made the switch to the new software, our old files created by WordStar could not be read because WordStar sets bit 8 active for some characters for hyphenation. We wrote a conversion program (in the C language) that strips off bit 8 and restores all characters to ASCII, which most word processing programs will use.

This program is available from us for \$5, which covers our media, packaging, and postage costs. Send a check to Micro Development Inc., P.O. Box 780-B, Lake Oswego, OR 97034, and ask for the WS2ASCII program.

Ed Sawicki  
Micro Development Inc.  
Lake Oswego, OR

## Words on Winchesters

You do a disservice to your readers by publishing articles such as "Hard Disks Made Easy" by Winn Rosch (Volume 1 Number 10). His lack of objectivity regarding competitive offerings in the removable hard disk cartridge marketplace and his inexperience with current Winchester disk drive technology are evident.

For instance, the flying height of a Winchester head is measured in millionths, not thousandths of an inch, and a head crash typically occurs after a period of time, depending on the effectiveness of the air-conditioning (filtering) system used in the head-disk assembly.

Rosch's statement that a smaller head-positioning mechanism enables faster data access makes no sense, and he makes no reference whatsoever to the importance of cartridge interchangeability between drives. No mention is made

of the effects that bearing and spindle wear may have on long-term ability of the system to accurately position the head. Only a drive with pre-recorded servo information using a precision voice-coil actuator is presently capable of performing these functions reliably, and Rosch did not even mention its manufacturer or the Genie implementation in his comparison.

If the author checks his notes he may find that the Genie 5x is not the first 5¼-inch removable drive available, since the supplier of that drive ignored some of the same design criteria that SyQuest elected to ignore, and has not shipped a working model to Genie.

On the other hand, the Genie 5+5 (5M fixed/5 removable) has been available in production quantities for end users, dealers, and systems houses since December, and it uses technology and features that successfully address the critical issues in removable Winchester design.

It is unfortunate, although understandable, that advertisements for unavailable or nonworking products can appear in your publication since planning and layout must be done months in advance. But to give the stamp of approval to any product by publishing a supposedly authoritative article is unfair to your readers and to competitive companies marching to the beat of a different drummer.

Bob Richard  
Goleta, California

Winn Rosch replies:

*It is unfortunate that in his hunt for errors Bob Richard missed the major thrust of the article, which was to introduce a valuable new technology to a nontechnical audience and to make potential users aware of cartridge Winchester drives as a realistic alternative for mass storage.*

*Richard does make valid points. Interchangeability of cartridges between*



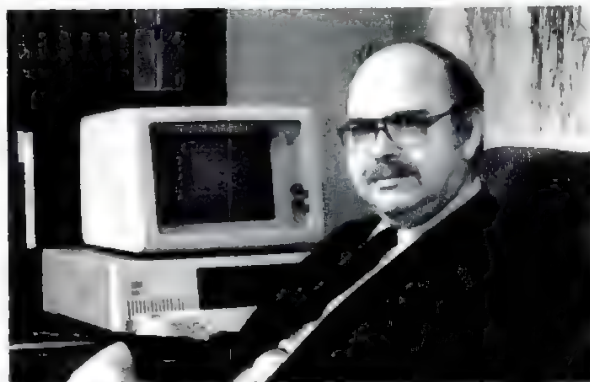
**"Personal Data Base is exactly the kind of program my customers need for the IBM PC."**

*Michael Madison, Peripherals Plus, Champaign, Illinois.*



**"Personal Data Base may well be the most useful program to come along for the Personal Computer."**

*Ed Coudal, software reviewer and writer.*



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Personal Data Base:	\$125.00
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CIRCLE 455 ON READER SERVICE CARD

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# Letters To PC

drives of the same system is important—and is claimed by the manufacturers of both systems described in the article. A transcriptional error was made (most Winchester heads fly at 14-18 micro-inches, or .014-.018 thousandths of an inch) but the comparison to the size of contaminants and the necessity of excluding them are both valid.

At no time did I make a judgment that one unit is superior to another. I cannot make such judgments because I have not tried every drive available.

## Chartman Critiqued

In "Getting More out of VisiCalc," (Volume 1 Number 10), Frank Derfler, Jr. comments on the Chartman graphics program. In the past several months I have used Chartman extensively to chart hundreds of graphs for Strategic Planning presentations. Derfler aptly describes the advantages of Chartman, but here are some other user criticisms and suggested areas of improvement.

The documentation is poorly organized and there are no tutorials, either in the book or on a disk. More detailed, coherent information with the first time user in mind is needed.

Chartman II displays graphs and menus in color. The menus, which are multicolored with a dark blue inverse field, are hard to look at for extended periods of time. As there is no particular use for the multicolor menus, a simple green menu would be preferable. The graphs are shown in three palettes only, which limits the versatility of the color display for stacked bars, for example. I am so irritated by the multicolor menus and restricted capability of the color graphics that I have disconnected the color monitor and now use a monochrome display.

Additional desired charting features would be filled-in (surface) line charts, plotting a bar and line chart together, floating titles, optional numbers inside

the pie chart, and horizontal and vertical grid selection.

The menus are easy to use, but are slow when making modifications. After getting up to speed with the program, I would like to take some shortcuts.

Elizabeth F. Young  
New York, New York

## 3 Views of "Eight Ledgers"

There is an error in the article entitled "Eight General Ledgers for Small Business" (Volume 1 Number 10), in the description of the IBM (Peachtree) General Ledger program. The authors state on page 162 that this program is not for service companies because the income statement uses a fixed format containing a cost-of-goods section.

That is not true. There is a wide degree of latitude permitted in formatting the income statement as well as the balance sheet, and the user has complete freedom in the development of his chart of accounts. Locally, there are at least three law firms and two service companies currently using the IBM General Ledger, each using its own individualized chart of accounts, and none of which is using a cost-of-goods section.

Ronald H. Peacock  
Port Charlotte, Florida

I enjoyed reading "Eight General Ledgers for Small Business," and hope you continue to print this type of software review in future issues. Our company will consider the shortcomings and strengths of these packages in our future development, which should benefit the developers as well as the users.

The issue of lack of security seemed to be a common thread in all the reviews, and it is important to direct attention to it. However, in a PC environment it seems to me that the point was overstressed. The software industry can barely control the protection rights in its own development, let alone attempt to

protect the user from the biggest security risk of all—himself.

Peter B. Hilgeman  
President, Computer-Time Corporation  
Morrison, Colorado

Thank you for Steve Yoder and Sherry Knight's article, "Eight General Ledgers for Small Business." We are in the market for an accounting package, but after reading their article, we are going to save our money and wait for something better. Keep up the good work.

I would like to make one complaint about all accounting packages I have seen so far: Where is the revolving charge option in your A/R module? Much of retailing revolves around monthly payments (Visa, MasterCard, Sears, etc.). If a software house wants to capture the hearts of retailers, it had better come up with a way to handle monthly payments without putting the customer past due.

Richard L. Strohkirch  
Gladwin Pro Farmers Supply  
Gladwin, Michigan

## Unsolicited Testimonials

As a neophyte computer user who not so long ago thought that RAM was a four-legged animal with big horns, that serial was a weekly television show, and memory something you lost when you got older, I want to take the time to bring attention to Spectrum Software Company of Sunnyvale, California. I purchased its Personal Finance Master (PFM) for a mere \$75, and not only received a powerful, useful program, but individual attention and help.

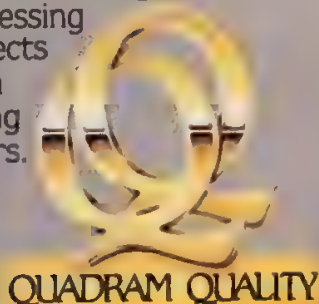
If any of your readers are considering purchasing a program to handle their finances, either at home or in a small business, I strongly recommend Spectrum Software's PFM. It is exceptionally easy to use and has many excellent features. The accompanying documentation is clearly and concisely written, and, if





## QUADCHROME™ BY QUADRAM™ DOESN'T DRAW THE LINE AT COLOR GRAPHICS

If you have an IBM PC you don't have to sacrifice color graphics for high quality resolution. Because now there's Quadchrome by Quadram. A monitor that displays graphs and charts plus accounting and word processing projects with flying colors.



Quadram is an RGB high resolution color monitor that delivers an 80 character, 25 line text display. And 690(H) dots x 480(V) lines resolution. Not to mention, 16 brilliant colors.

With a monitor that gives you such an excellent screen image and a rainbow of colors to choose from, all your applications will be picture perfect.

You'll find this .31 mm dot pitch CRT is both FCC and UL approved. And backed by a tradition of Quadram Quality.

Get the color monitor that really gets down to business. Quadchrome by Quadram. It's the only monitor your IBM PC will ever need.



**Quadchrome.  
All The Monitor  
You'll Ever Need.**



4357 Park Drive / Norcross, Ga 30093 / (404) 923-6666  
TWX 810-766-4915 (QUADRAM NCRS)

Split screen demo is for ad purposes only

**CIRCLE 382 ON READER SERVICE CARD**

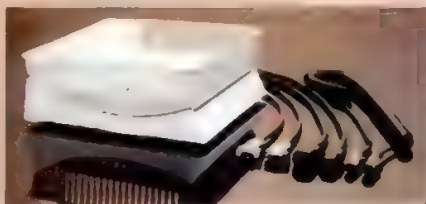


A lot of quality products from companies like Visicorp, Ashton-Tate, IUS, Hayes, and Corona Data Systems have made life for the IBM PC user a whole lot easier. And more productive.

Add Curtis to that list.

Because now, thanks to our PC Pedestal™, you can "tilt and swivel" your IBM display, instead of your body. No more bobbing and weaving to avoid glare. No more neck and eye strain. That means you'll pay a lot more attention to what you're doing, then to how uncomfortable you're feeling.

To make your life even easier (and a bit more comfortable), you can have extension cables, too. A 3-foot set for your display unit and a 3 to 9-foot coiled cable for your keyboard let you arrange your system any way you want. They're fully shielded, and come with the highest quality connectors.



So next time you sit down at your IBM PC, make yourself a little more comfortable.

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Curtis PC Pedestal™ .....\$79.95  
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3 to 9-Foot Coiled  
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## How to re-arrange your IBM PC... very comfortably.





# Letters To PC

necessary, staff people will politely and cordially help you over the phone.

Allen F. Natella  
Almagordo, New Mexico

If you are looking for a good data base program, I would like to recommend one that is reasonably priced. PC-File by Jim Button of Bellevue, Washington, is an excellent program with many possible applications. The author is very responsive to questions and open to suggestions on how to improve it.

One of the things I like about PC-File is that it is one of several user-supported programs available. If you like it you are asked to send whatever you feel it is worth to the author (a minimum amount is suggested but not required), and you are encouraged to copy it and distribute it to others.

To receive a copy, just mail a disk with a self-addressed postage-paid mailer to Jim Button, P.O. Box 5786, Bellevue, WA 98006. If you prefer you can send a \$35 prepaid order, in which case Button will supply the disk, postage, and mailer. Included on the disk is a complete operations manual for the program.

L.W. Summers  
Milwaukie, Oregon

## Busy Signal

I have just finished reading the review of Answer by Mark Phillips (Volume 1 Number 10). Unfortunately, I do not feel that this review is complete.

Answer claims to be a type of database, but in my opinion its capabilities are limited. As advertised, this program is excellent if you wish to utilize your computer as a Rolodex card file. Otherwise, the more fields you use in the program the more bogged down it becomes. As a medical doctor, I find the program very slow and almost useless in holding summaries of patient accounts.

I also find the browsing command very confusing, and the program does

not work if you enter the first initial of the last name and then ask it to "find."

I must compliment North American Business Systems for its telephone support, which was excellent. The staff was willing to help with a minimum of waiting time. However, I did not appreciate their empty promises of "updates" that were going to be out "next month." I am still awaiting the report generator that was originally going to be distributed "no later than" December 31, 1982.

Phillips did not mention the sort utility, which I find the most interesting part of the program. According to the program instructions, you must sort all entries after you have entered new information. In the configuration that I used, I was able to store approximately 150 accounts in each disk. I deplored using the sort utility, since I knew when I asked Answer to go through its double-phase sort that it was time to sit down for dinner with my family. Ask Answer to sort and your waiting time is 15-30 minutes!

Dr. Jeffrey Feldman  
Torrington, Connecticut

Mark Phillips replies:

Answer's sort routine never took longer than one minute while I was reviewing it. It does, however, take longer with increased amounts of stored data.

North American Business Systems does not market the product as an all-purpose database manager, but rather an "information organizer."

## Flanagan Was First

I'd like to correct an inaccuracy in the news item "The Literary Life," which appeared in PC-Communiqués (Volume 1 Number 10). *Blind Pharoah* by Burke Campbell, was not "the first completely electronic novel."

*Blind Pharoah*, which first appeared on The Source on November 17, 1982, was preceded by my electronic novel, *Mylar's Warp*, which went public on

The Source on October 19, 1982.

Subscribers interested in a quick review of the world of electronic literature can find it by typing Public at the command prompt while on The Source.

Thank you for helping to get the facts straight.

Floyd Flanagan  
Long Beach, California

Thanks for straightening us out. To read more about Mylar's Warp by Floyd Flanagan, see PC-Communiqués in this issue.—Ed.

## Send a Lifeboat

I enjoyed "Five C Language Compilers" by Hanno Hinsch (Volume 1 Number 10), but it is unfortunate that the author did not test and critique the Lattice 'C' compiler advertised by Lifeboat Associates in the same issue of PC.

It would be helpful to know how this compiler compares with those described in the article, especially since Lifeboat Associates claims that it is a full implementation of C.

Allen C. Miller  
Sunnyvale, California

Coming soon. For more information on Lattice C, see the following letter.—Ed.

Reading your recent article, "Five C Language Compilers," reminded me of my days at the University of Missouri in Columbia, Missouri, where the seniors used to tell the freshmen that the five top drinking schools in the U.S. were Oklahoma U., Kansas U., Iowa, Ohio State, and Arkansas. How about ole M.U.? Well, it seems Missouri couldn't compete because it wasn't fair to rank a professional with the amateurs.

Just for the record, Lattice Inc.'s C, sold exclusively by Lifeboat Associates for the IBM PC and other MS-DOS and CP/M-86 systems, is a full implementation of Kernighan and Ritchie's C language. The runner-up's benchmark time



# Letters To PC

was 74 seconds, making Lattice C 78 percent faster. The runtime of the same program was 10.5 seconds for Lattice C compared with the runner up's 15.0 seconds, giving Lattice C a 43 percent edge. The size of the .exe file created by the program was middle of the pack—19,504 bytes against an average 18,739 for the five compilers reviewed.

Lattice C, which never assesses a royalty on programs generated using its library or compiler, has hundreds of satisfied customers. For more information contact Lifeboat Associates, Department C, 1651 Third Avenue, New York, NY 10028, (212) 860-0300.

Todd Katz  
Lifeboat Associates  
New York, New York

## C-ing Red

"Five C Language Compilers" (Volume 1 Number 10) was excellent. Hanno Hinsch did a commendable job of describing C and evaluating the five compilers. His article should be required reading for anyone wishing to use C language on the IBM PC.

My company, Logical Systems, develops specialized software. We use many languages and assemblers, and work on many different types of microprocessors. Having C available for the PC will make much of our software transportable from other machines to the PC. After reading Hinsch's article, we were planning to order several of the C-compilers, and this is where we ran into a problem.

The article implied that the C-Compiler manufactured by c-systems is available for \$195, and that this price includes a debugger called c-window. When I tried to order this package, I was told that it would cost \$390, because the compiler and debugger are sold separately and are priced at \$195 each.

I would have accepted this answer had I not looked at the c-systems ad appearing in the same issue as the C-com-

piler article. The ad also implied, to me, that the compiler and debugger were priced as a package. C-systems admitted that the ad was ambiguous.

To add to the confusion, PC:Bluebook in the same issue contained still another description of c-systems' products, and here it was stated that the debugger was priced at \$125. C-systems did not have an explanation for this, and I cancelled my order.

I was upset by this runaround particularly because I am in the software business, and I could not continue building and selling software if I did not have the trust of my customers. The confusion I faced in my dealings with c-systems jeopardizes the trust that the computer industry has worked hard to build.

Thanks for a good magazine, for good articles like the C-compiler evaluation, and for providing a sympathetic ear.

Charles E. Deiotte  
President, Logical Systems  
Colorado Springs, Colorado

*We received the following letter from James Eakins, who works in the marketing department at c-systems and is one of the authors of its C-Compiler and c-window Debugger. It should help clear up the confusion described in Charles Deiotte's letter.—Ed.*

We at c-systems wish to thank Hanno Hinsch for including our C-Compiler and c-window products in his fine article, "Five C Language Compilers."

This article and some of our advertising appear to have generated some misunderstandings about our pricing policy for these products.

Although the article indicates that c-window is included with the compiler, this is not the case. The c-systems C-Compiler and c-window have always been, and continue to be, sold as separate items. C-window does require the c-systems C-Compiler for its operation.

The advertisement describing our C-

Compiler as "Now with c-window" has either been discontinued or modified to show that the C-window product is not included with the C-Compiler.

The price for the C-Compiler has always been, and remains at this time, \$195. When introduced, c-window was priced at \$125; the price is now \$195.

Finally, c-systems reserves the right to change its prices and its specifications without notice.

C-systems makes every effort to provide quality, innovative products, and plans release of other programmer aids in the coming months. We invite further dialogue in the programmer community for our combined benefit.

James Eakin  
c-systems  
Fullerton, California

## Legal Ramifications

I enjoy reading your magazine in bed. Holding it above my face with both hands helps strengthen the wrists, but I live with the constant fear that as I become sleepy, the magazine will crash down on my face, killing me instantly or causing permanent disfigurement. Volume 1 Number 11 weighed in at two pounds, eleven ounces!

My questions to you are: 1) Are you legally responsible if your magazine injures or kills me? 2) How about my postman? (He's not as cheerful toward me anymore.) 3) With the growth in circulation and the increased thickness of your magazine, are our national forests seriously endangered?

I wish you continued success.

Robert S. Lindsay  
Baltimore, Maryland

Our attorneys have advised us to answer as follows: 1) We cannot be held responsible for unauthorized uses of PC Magazine, such as body-building. 2) Please convey our thanks to your postman for



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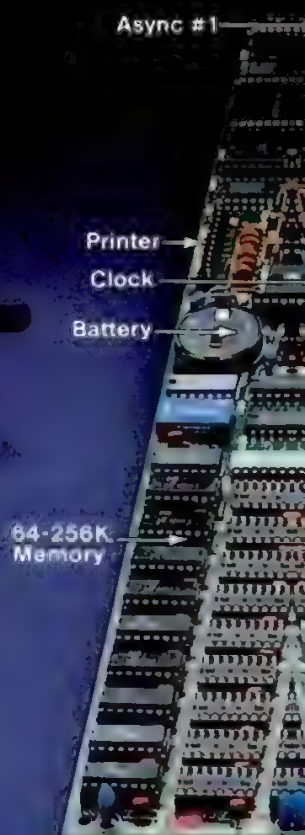
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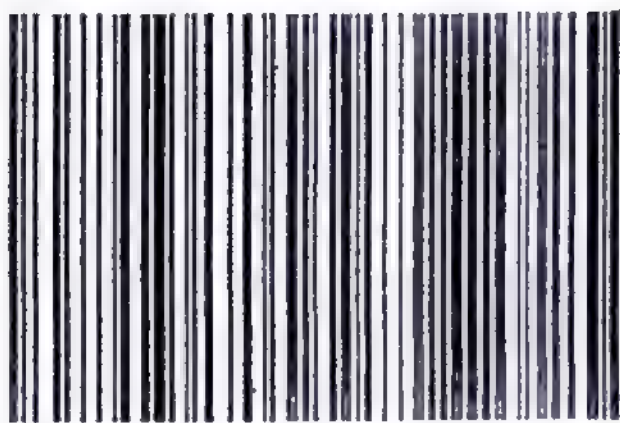
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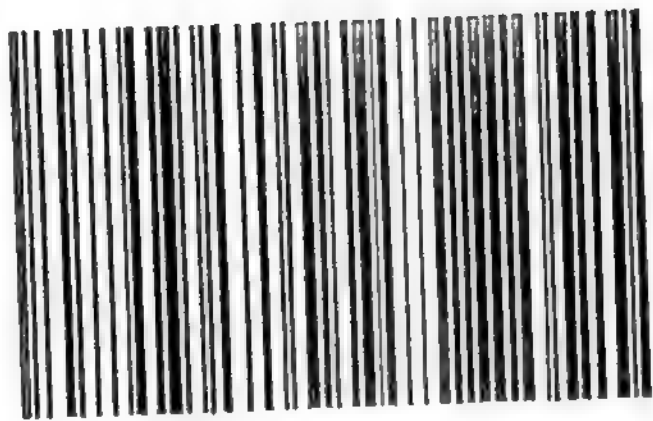
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The image displays three different multifunction cards and a mounting bracket. The cards are populated with various integrated circuits, capacitors, and connectors. The mounting bracket is a metal plate with four D-sub connectors and a central mounting hole.

**AST-5251** (left card) labels: Async #1, Printer Clock, Battery, Async #2, 64-512K (with MegaPak), MegaPak.

**I/O Plus II™** (middle card) labels: New! With Game Port, I/O Plus II™ is an enhanced version of I/O Plus featuring: • One Clock Calendar (std.) • Two IBM Compatible Async Ports (1 std., 1 opt.) • One IBM Compatible Printer Port (opt.) • One IBM Compatible Game Port (opt.) • SuperDrive™ • SuperSpool™ • From \$165.

**MegaPlus™** (bottom card) labels: MegaPlus™.

**ConnectALL™** (bottom right) labels: NEW! AST Proprietary Connector Mounting Bracket for PC only (does not include cables shown in illustration).

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# Letters To PC

shouldering his part of the burden; we're sorry if we've come between you. 3) We're told that trees are a renewable resource. We love trees, we think. Being from New York, we've never actually seen one.—Ed.

## Farmers' Market

I read with interest your item on Homestead's Farm Management System, "chosen the best farm management software program by the Illinois Farm Bureau in 1982" (PC-Communiqué, Volume 1 Number 10). Could you provide the address and any other details of this organization?

Ted Clark  
Owen Sound, Ontario

For information on Farm Management System, write the Homestead Computer Company, 2530 Crawford Ave. #317, Evanston, IL 60201, (312) 864-6777. Also see "Computing Down On The Farm," in this issue.—Ed.

## Key to the Problem

Concerning "Keyboard Katastrophes" in Quebec (Letters to PC, Volume 1 Number 11): Put me on the list. In my case, however, I've found a solution.

I use an old Conrac video monitor, government surplus, complete with homemade cabinet. I have done a certain amount of modifying and adjusting to get a sharper image. While I was trying out a new adjustment, the keyboard started to enter random numbers onto the screen. Fearing the worst, I checked everything, including the line voltage. Of course, everything was perfect.

Then I noticed that I hadn't replaced the CRT grounding spring, the long spring that brushes the back of the CRT and loosely attaches to the chassis (and always gets in the way when you have to pull the chassis). When I reattached the ground spring, the problem vanished and never came back. It may well be

touring Quebec at this very moment.

I hope this provides a solution for some "keyboard katastrophe" sufferers.

Joe Carroll  
Huntsville, Alabama

## Happy With APL

I have been very pleased to see numerous articles related to APL in the microcomputer literature in the past few months. Like many other APL buffs, I welcome the language to the micro with open arms.

Robert S. Lee's review of STSC's APL\*PLUS/PC ("PC APLication," Volume 1 Number 11) was well done. STSC's APL is everything Lee said it is and perhaps more.

My APL history goes back to 1968 when I was attending Pratt Institute and IBM was giving APL away free to universities. At that time, APL had a 32K workspace, no formatting, and no file system. We used a 10 character per second IBM Selectric terminal that could be heard on the next floor. The power of APL was overwhelming even then.

I have seen many enhancements of APL over the years, but what STSC has done with its APL on microcomputers is the ultimate enhancement. I have been using this APL on my TRS-80 since it was released last year. This is a very fine implementation, but it is severely limited by the machine.

The IBM PC version, on the other hand, is limited only by the user's imagination. It is better in many respects than mainframe and minicomputer APLs I use, and it is by far the most professional implementation I have seen.

APL has truly found a home on the IBM PC, and will prove to be a very useful tool for program developers.

George F. Weiss  
Red Bank, New Jersey

## Mono-mania

I enjoy your fine magazine, but I have one general complaint. My PC has a monochrome screen. I use it largely for word processing, and the monochrome works great. But many of your excellent programs, reviews and articles require color/graphics, so I can't use them.

Volume 1 Number 10 included "Kaleidoscope" and "How to Build a Computer Maze." Fantastic! But I need monochrome versions, please. Previously, you've printed games and graphics, all requiring color/graphics. I do like to have fun, and a monochrome screen can do lots of things. Can you please place more emphasis on monochrome screens or print programs that work in either color or monochrome? Please consider monochrome users!

Terry F. Pettijohn  
Marion, Ohio

We have no bias against monochrome display adapters or their owners. However, the monochrome display adapter does not draw graphics, and as such is not capable of the sort of fancy pictures that can be produced by the color/graphics card for the IBM PC. But keep reading PC, we've got some articles coming that will put a smile on your face (and your monochrome screen).—Ed.

## Support for Starwriter

In her review of WordPerfect (Volume 1 Number 11), Lindsay Van Gelder gives the impression that the F-10 Starwriter Printer is not supported.

Leading Edge, the U.S. distributor for the Starwriter, informs me that the F-10 was designed to use the same command set as the Qume Sprint 5, which is supported by WordPerfect. I have had the opportunity to use the F-10 with many text-processing programs, and I have always found the Qume Sprint 5 configuration to work for the F-10 as well.



# BEYOND THE DREAM

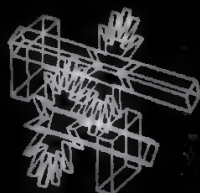
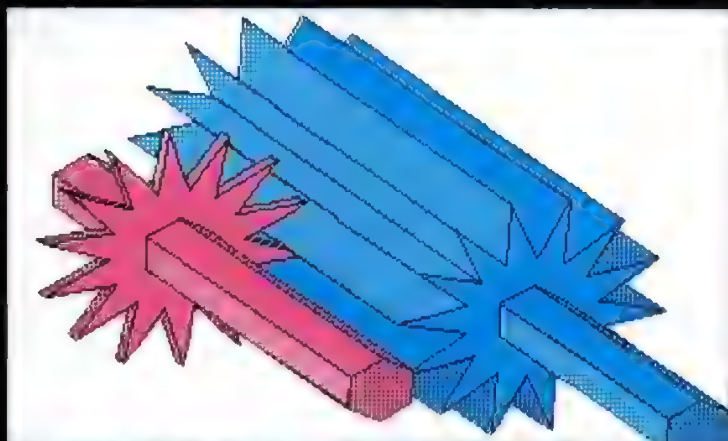
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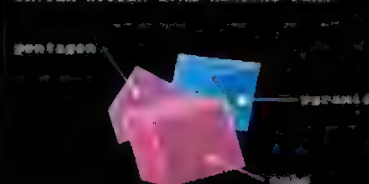
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# Effortless Communication



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CIRCLE 464 ON READER SERVICE CARD



One can only speculate as to why this information is not included in the Starwriter manual, but it should be useful to other Starwriter owners.

Frederic Woodbridge Wilson  
Neptune, New Jersey

### Can't Wait for PC

As executive editor Corey Sandler stated in Volume 1 Number 10, PC has become an "essential peripheral," so much so that I can hardly wait to get my hands on each month's "book." When is PC going to start arriving to us charter subscribers in a more timely manner?

John B. Williams  
Des Moines, Iowa

Part of the problem involves the sheer size of PC. We're working on it, though, and we think you'll be pleased with our product and our punctuality in coming months.—Ed.

### Clubs for Kids

I am considering starting a computer club for children (age eight and up) who have access to an IBM PC. Does anyone have information to help point me in the right direction?

Seymour Manello  
Rochester, New York

For general advice, see "How to Start a User Group" (Volume 1 Number 10). Is there anyone out there who has started a group for children? We'd like to hear from you.—Ed.

### How To Write To PC

Please mark on the outside of the envelope the department you are writing to, whether "Letters to PC" "User to User," "PC Tutor," "PC-Communiqués," or "Club News".

Send New Product announcements to: "New on the Market" at the same address, clearly marking the department on the envelope face.

### How to Write For PC

We'd very much like to hear from writers and users who have stories to share with the readers of PC Magazine. If you are sending in a manuscript, please be sure to indicate on the face of your envelope, "Article Submission." If you wish to discuss story ideas or submit an outline, please mark the envelope in the same way.

Manuscripts should be typed or printed on white paper, double-spaced, with paragraph indents of five characters. Do not hyphenate words and do not justify copy. Please put your name, address, and phone number on page one of the manuscript, and include your name and a page number on every page. Include full information on manufacturers' address, prices, hardware and software requirements and special notes at the beginning of articles.

PC will pay a bonus on acceptance if the article is provided on a 5¼-inch IBM PC disk, written with WordStar word processing codes. Include a printout with all disks.

Program listings submitted for consideration must be provided on disk.

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—New York, NY 10016

### Corrections

The address for Dragon Data Systems, manufacturers of PC Parrot, was inadvertently omitted from "The PC Talks Back" (Volume 1 Number 11). The address is: PC Parrot, Dragon Data Systems, 1068 Homer Street, Suite 110, Vancouver, British Columbia V6B 4W9 Canada.

The telephone numbers of the Software Company of Australia have changed since they appeared in the article "Tie Me IBM Down, Boys" (Volume 1 Number 11). The new numbers are: New York, (212) 846-1142; Melbourne, (613) 347-7447.

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Adding a printer to your computer makes sense. But deciding which printer to add can be tricky. Do you settle for a printer with limited functions and an inexpensive price tag or buy a more versatile printer that costs more than your computer? Neither choice makes sense.

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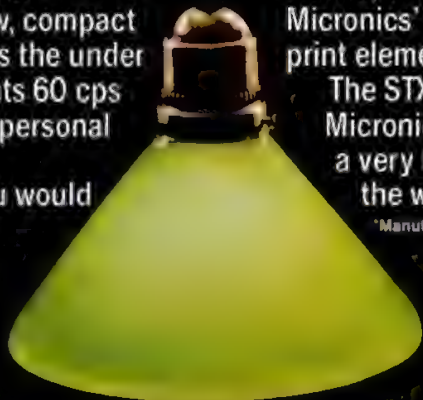
The STX-80 has deluxe features you would

expect in higher priced models. It prints a full 80 columns of crisp, attractive characters with true descenders, foreign language characters and special symbols. It offers both finely detailed dot-addressable graphics and block graphics.

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# PC-Communiqués

A compendium of facts, news, opinions, gossip, inside intelligence speculation, and forecasts about IBM Personal Computers.

## Osborne Befriends the PC

Adam Osborne, the patriarch of portability, has announced that his spanking new Executive I suitcase-model computer will soon have an add-on 8088 board that will turn the Executive I into an "Executive II" and run IBM PC software.

The Executive I is a flashier version of his original Osborne I, with a snappy 7-inch 80-column capacity amber screen, two single-sided half-height 5¼-inch disk drives, 128K of RAM, and the same old 4MHz Z80 CPU. It will cost \$2,495 to carry one home, and another \$600 or so to make it IBM-compatible.

The Executive I comes with \$2,000 of "free" software, including WordStar 3.3. The company won't say when the PC work-alike Executive II will hit the stores, but industry experts predict that it will be ready this summer. Osborne said he wanted to "fill up the warehouses with Executive IIs" before announcing they were available. Some observers think he's actually still polishing the 8088 card.

Kaypro's Andy Kay wasn't worried. "Osborne's moving out of the low-priced market he created. He was going to bring his Osborne I out at \$1,595 and later ran it up to \$1,795. Now he's selling only a slightly improved machine for \$700 more, and its screen is still 2 inches smaller than ours." Kay also pointed out that you can now buy his Kaypro with a 10 megabyte hard disk and \$2,800 worth of "free" software for—you guessed it—\$2,800. And he's working on an IBM-compatible version too, although he admits Osborne beat him to the punch.

The eponymous Mr. Osborne told PC that he thought the Executive II would have so much impact that it would prevent others who were thinking of producing PC clones from proceeding. Fat chance. Manufacturers are all out there at this very minute finding ways to jam an 8088 into every printed circuit ever made. We're waiting to hear about the first PC-DOS-compatible abacus. Stay tuned.



## Our Town

No, ComputerTown isn't a place where Spencer Tracy gives wayward young micros a new start in life. It's an organization with worldwide affiliates seeking to bring computer literacy to local communities.

ComputerTown was founded in 1979 by the People's Computer Company in Palo Alto, California. This nonprofit center offers introductory and intermediate classes in the San Francisco Bay Area and creates specialized workshops and courses for organizations and businesses.

The Palo Alto group has shared its experience with the rest of the world through its *ComputerTown News Bulletin*, introductory books, and a series of small guidebooks. So far three guidebooks have been published: a *Glossary of Microcomputer Terms*, *Microcomputer Q & A*, and *A Bay Area Guide to Computer Stores*.

Over 250 businesses and groups (including schools, clubs, and scout troops) throughout the world have become ComputerTown affiliates. The Palo Alto center aids its affiliates with information, including a 200-page *Implementation Package* filled with advice on setting up computer literacy projects in their communities.

To become a citizen of ComputerTown, send \$25 for a year's Personal Membership (only \$15 if you're under 16); you'll receive the bimonthly *News Bulletin* and other services and discounts. ComputerTown affiliates can be started by sending \$50 for a school or community group membership or \$100 for a Commercial Membership.

ComputerTown might not be on the map, but it can be reached at P.O. Box E, Menlo Park, CA 94025, (415) 323-3111.



# PC-Communiqués

## Express Software

Enclosing product offerings with monthly bills is not a new practice; credit card companies rarely let a month go by without including some offer designed to entice customers into painlessly increasing the size of their next monthly bill. Now, American Express, with 15 million card holders on its billing lists, is taking a serious look at a new wrinkle in product offers: software.

One company, SoftLink Corp. of Santa Clara, California, acknowledges that it has talked with the credit card giant regarding inclusion of its software products in an American Express mailing. SoftLink markets encrypted versions of leading software for \$49.95, allowing customers to "test drive" a program before paying the balance of the program's full price.

## Evil Aliens Control IBM?

PC Magazine was unable to confirm the lurid report screaming from bold headlines in *The Digital Tattler* (price: "2 Bits") that "Evil aliens from a distant galaxy have taken over the world's largest computer company . . . and are bent on using their strange powers—including telepathy, mind control, and devil worship—to wreck the computer industry."

This alarming "exclusive," under the byline of one Freddy Smarm, is bolstered by a four-color photograph on page one showing three day-glo flying saucers descending on the IBM headquarters in Manhattan. Most

New Yorkers, apparently distracted by King Kong's most recent shenanigans atop the Empire State Building, failed to notice the invasion.

The Smarm piece quotes an unidentified expert that the aliens "come from the planet Ziploc, where there is no such thing as morality as we know it. I wish it weren't true, but it is. . . . They're going to market floppies that let you talk to the devil. They figure they'll sell like hotcakes, and Satan will tell people to do weird things like offer their electronic banking cards to strangers. It's going to be chaos if they aren't stopped!"

This April 1, 1983 issue of *The Digital Tattler* also revealed that 39 programmers in India

were killed by a miscoded subroutine while running an after-hours football betting pool.

On the human interest side, an article titled "Ordinary People Tell How They Use Their Personal Computers" noted that Mrs. Vera Farber, of the La-Z-Court Trailer Park in Lima, Ohio, uses her Apple II to keep track of how often her husband mows the lawn.

PC Magazine, which is obviously missing some big stories, has not been able to locate subsequent—or previous—issues of *The Digital Tattler*. However, we suspect that the *Tattler* itself is a part of the extra-terrestrial assault. Some strange force appears to have overwhelmed the editors of *Datamation* and caused this alien publication to spring from the center of their April 1983 issue. Where will they strike next?

## Warning! Warning! Warning!

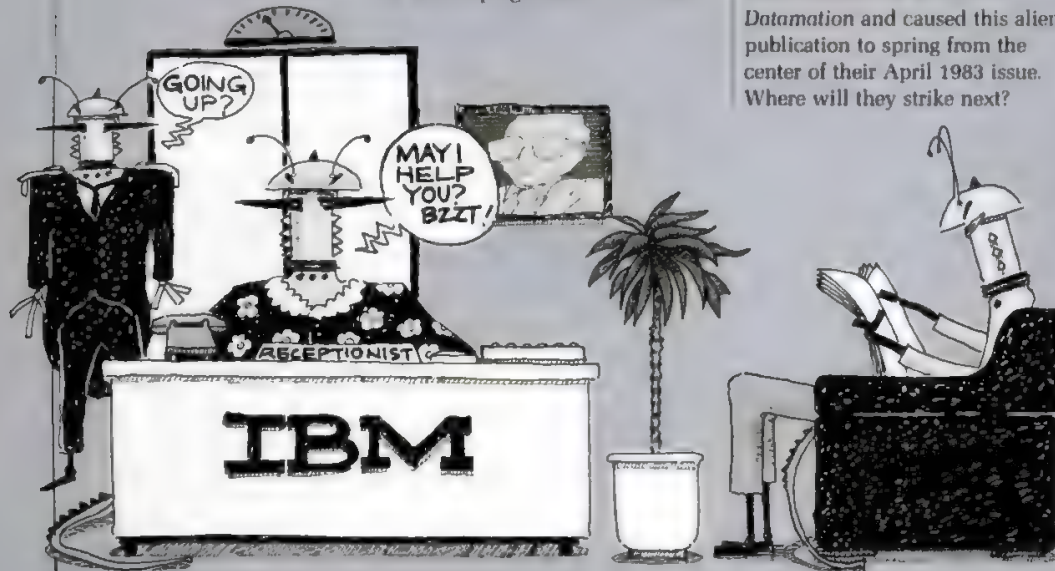
If you're walking down the street and notice office workers tossing PC-XTs out their windows in fits of frustration and anger, it's



probably because IBM neglected to include a critical warning on its PC-DOS 2.0 FORMAT utility.

Here's what happens: You painstakingly loaded the contents of 63 single-sided floppies onto the XT's fixed disk—or worse—filled the entire hard disk with brand new information. Later you decide to format a blank floppy disk to back up your data. The system is ready to go since you're already in Drive C: (the fixed disk), so you type in FORMAT. But, say you forget to add an A: to tell PC-DOS where the floppy drive is. The second your finger hits the Enter Key, 10,000,000 bytes of data vanish as the hard disk—not the floppy disk—formats itself.

IBM should have included an automatic safeguard to prevent this. Maybe a siren and a flashing red light would be appropriate. At least an onscreen message that alerts you to the possibility of sending all existing hard disk





data into the bit bucket. And PC-DOS shouldn't allow hitting any single key to start the process; it should make users type in Yes if they really want to go ahead and erase everything.

**Moral:** Back up the hard disk frequently, and be exceedingly careful when using the **FORMAT** command. Better yet, erase the **FORMAT** file from your hard disk so that you don't mistakenly use it some night at 3 a.m. If you really want to be safe, throw a line into your **AUTOEXEC.BAT** file that says **ERASE C:\FORMAT.COM**.

## You Are Cordially Invited...

If you are interested in submitting software to **PC: The Disk Magazine**, a pamphlet titled **Software Submission Plan** is now available explaining its standards and procedures.



**PC: The Disk Magazine** is a new publication dedicated to expanding and diversifying the software libraries of subscribers. Companies, groups of authors, and individual authors are welcome to make submissions. However, all submissions must meet certain requirements before they are published. These are

explained in detail in the **Software Submission Plan** pamphlet.

To assure quality, the editors of **PC: The Disk Magazine** first review a "Software Submission Agreement" before deciding if they are interested in marketing the software. If they are interested, they will contact the author(s) to request the program code and documentation for

further evaluation.

This evaluation can be rigorous. The editors may conclude that modifications are required in the submitted program. The time required from submission to publication is expected to be 3 to 6 months. Details of program modifications, royalties, and advances are contained in a software contract to be provided by the editors.

**PC: The Disk Magazine** plans to publish software ranging from specific applications to stand-alone programs, utilities, and subroutine libraries. Naturally, all submissions must be original and must operate on the IBM Personal Computer.

For more information or to request a **Software Submission Agreement**, write to **PC: The Disk Magazine**, Author Submissions, Department 732, One Park Avenue, New York, NY 10016.



## The Adventures of Mylar the First

As some subscribers to *The Source* already know, *Blind Pharoah* by Burke Campbell was not the first completely electronic novel ("PC-Communiques," *PC*, Volume 1, Number 9). Campbell's book came in a close second to Mylar's *Warp*, a science fiction work by Floyd Flanagan.

*Mylar's Warp* can be read on a home computer screen by anyone who subscribes to *The Source*. You can hold your place with an "electronic bookmark" or print the pages of the novel. The story contains all the elements of sci-fi, plus a few from the world of computer games: cryogenic preservation, electronic domination of the world, an erotic ideal named Sugar Cube, warring generals with deviate armies, and super power beams. These and other varieties of future shock are experienced by Johnny Mylar, a modern-day man hurled forward in time.

"This new electronic approach could have a profound impact on the publishing industry, and perhaps on literary tradition," says Floyd Flanagan. Perhaps. Perhaps not. Flanagan is, after all, planning a traditional paperback version of his novel.

# PC-Communiqués

## Jetting with the Micro-Set

Are you a computer show addict? If you are, and fear you won't be satisfied by hitting Atlanta for Comdex Spring, San Francisco for Comdex Fall, and Miami for Interface Age, don't despair. There's another world of computer shows on the Pacific Rim that can keep you supplied with information, contacts, glitter, hype, and fatigue.

In October you can indulge in a mad spell of island hopping to keep up with the industry. The Japan Electronics Show in Tokyo (October 6-11) overlaps with the Taiwan Electronics Show in Taipei (October 10-16) and

Seoul's Korean Electronics Show (October 11-16). Next stop, Kowloon for the Hong Kong Electronics Show (October 16-18). You come full circle back to Tokyo, for the Computer Data Show (October 18-21).

After this grand tour, your eyes might be too red from jet lag to ever stare into a CRT again. But just think of the pleasure you'll have telling stories at all the domestic computer shows next winter—over a hot cup of saki, of course.

## PC-Communiqués Pays

Do you have news, gossip, or unusual computer tales for PC-Communiqués? We will pay up to \$50 for each submission used. You must include your name, address, and telephone number with the item. We will preserve your anonymity if you wish. All submissions become the property of PC and are subject to editing. Our User-to-User section also publishes and pays for readers' submissions; that section features tips, problem solutions, and short programs or routines. Please send submissions to the appropriate department—PC-Communiqués or User-to-User—at PC, One Park Ave., New York, NY 10016.

## Goliath 2, David 0

Since the success of IBM's Personal Computer has gone from being a speculative opinion to a fact of the marketplace, many companies have been inspired to offer similar microcomputers at somewhat lower prices. As long as IBM's price is higher, these smaller imitators are likely to find ready buyers among bargain-conscious computerists.

How long can small manufacturers hold their ground against the Big Blue giant? A parable of their coming fortunes might be found in the tale of Magnuson, a company that came up against IBM in the mainframe arena.

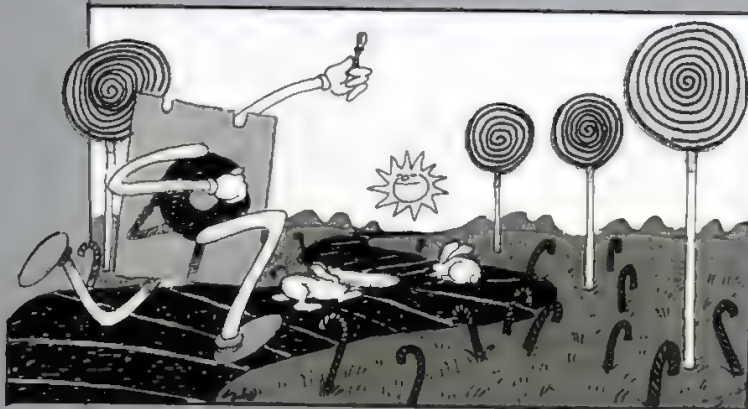
Magnuson was started by a group of engineers with the bright idea of designing a system that was "plug compatible" with the IBM 370. They succeeded, and came to market with a comparable, more reliable computer priced about 15 percent less than IBM's.

Before Magnuson could sell many of its more-for-less mainframes, IBM announced its new 4300 series computers with prices that came down to meet

Magnuson's level. The small newcomer tried to maintain its competitive edge by cutting its prices even closer to the bone. Now, according to *The Jeffries Report*, the conclusion to the Magnuson story can be read in Chapter 11 (the bankruptcy act).

Manufacturers of PC work-alikes should take care not to use lower price tags as their only shield against Big Blue's clout. Many competitors must already be shaken by IBM's 15 percent price cut for the PC, following the announcement of its XT. The giant struck its next blow by permitting its National Accounts Division to offer greater discounts on high-volume orders from corporate customers.

In the computer marketplace, the old riddle still holds true: Where does a giant sit? Anywhere it wants to.



## Mother Goose Goes Digital!

It's true. Spinnaker Software Corporation of Cambridge, Massachusetts, recently announced that Dale Disharoon (great name!) has developed a line of IBM PC-compatible kiddieware called *Hey Diddle Diddle*. The collection of 30 classic nursery rhymes features both music and color graphics, and "helps children understand how words and rhymes create poetry," according to Spinnaker.

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# Looking For Compatibility



## New DOS For Old

**Q:** Now that PC-DOS 2.0 is available, should I switch to this latest version? I know that this operating system has a lot of nice new features, but I already have quite a lot of software that uses DOS 1.1. Which programs will or won't work on the new system?

Several Readers

**A:** For the most part, software that runs under PC-DOS 1.1 will run under PC-DOS 2.0. Software written for PC-DOS 2.0, however, might not run under DOS 1.1. PC-DOS 2.0 contains a number of very useful system calls that I, as a software author, would hate to ignore. You should expect that some new software may be restricted to use with PC-DOS 2.0, as the programs will depend on those new calls.

PC-DOS 2.0 supports hard disks and nonstandard video display adapters much better than PC-DOS 1.1 does. Under PC-DOS 1.1, manufacturers had to modify the internals of the operating system to get a hard disk to work; the result was a

hodgepodge of incompatible hard disk systems. I would expect that most hard disk systems are rapidly being converted to PC-DOS 2.0; for some systems, it may be a requirement.

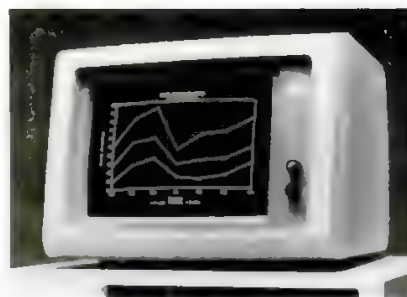
Much upcoming software and hardware for the PC will be restricted to PC-DOS 2.0; to use these you'll be forced to purchase the new operating system.

As to incompatibility: there are a few software packages that will not run under PC-DOS 2.0. My discussions with IUS (the makers of EasyWriter) indicate that EasyWriter II will not run under PC-DOS 2.0. According to the IBM manuals, EasyWriter 1.1 will run with DOS 2.0, but the BPI accounting package and the PeachTree accounting package (Version 1.00) will not run under DOS 2.0. I have not seen

any other older programs having problems when run under version 2.0; most popular software has been checked out.

The problems you are most likely to encounter with PC-DOS 2.0 lie in memory constraints. If your PC has only 64K of memory, then some programs may run out of space, because PC-DOS 2.0 requires an additional 12K or so of memory to run. For example, the IBM Arithmetic Games require 96K under PC-DOS 2.0, as do the IBM Asynchronous Communications Support Program and Fact Track.

PC-DOS 2.0 also allows the use of two conveniences that could take up additional memory. With it you can set up disk buffering and can use the ANSI.SYS device driver. Disk buffering will speed up some programs, but the price is that each sector buffer takes up 528 bytes. Arbitrarily, I tend to use 18 buffers, which require a total of about 9K in RAM. The ANSI.SYS driver lets you redefine function keys easily, but it also takes up space. The amount of memory it requires is undocumented; the total probably depends upon what



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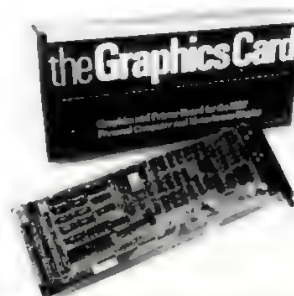
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keys you redefine.

When using these enhancements, programs might not leave as much space untouched as before. Programs which formerly required 64K may require 96K. Programs which required 128K may require 196K. If your memory is tight on space, don't use the BUFFERS or ANSI.SYS options in your CONFIG.SYS file.

If a program does some unusual things with the disk drives, then you may also encounter trouble. The definition of one operation system call has been redefined in PC-DOS 2.0: call number 1B. If your program tells you how much space is available on a disk, then it is a sure bet to encounter trouble with version 2.0.

The layout of higher capacity disks (the 9-sector disks which provide 360K on a double-sided disk) is changed for PC-DOS 2.0, so programs which read the disk directory directly will have problems. Also, because PC-DOS 2.0 supports so many different types of drives, any program that expects only single- or double-sided disks can easily get confused by provisions for alternative drives.

Another problem lies in the use of trees. PC-DOS 2.0 has the ability to partition your disk into groups of similar files, called subdirectories. In programs written for version 1.1, however, you cannot access files in other subdirectories. This change may make you decide to avoid using subdirectories altogether, but don't

names with the characters <, >, !, or \, then you need to rename the files before you try to use them under version 2.0.

Some new features to watch out for include the BREAK ON. You can use this to break out of a program that does very little character input or output; but the program may not be prepared for you to

***BE VERY CERTAIN  
that you use an input  
file that will handle all  
the expected questions.***

use that ability. In the same vein, it appears that the PC-DOS 2.0's print calls now offer you an "Abort, Retry, or Ignore?" question, rather than the old "Printer Fault" message. This gives you a chance to abort from the middle of a critical program. With older programs, however, it is probably safer to correct the error and key in R for "Retry."

Also, some previously unused areas in the program segment prefix are now used by PC-DOS 2.0. If your program relocates itself there to reduce memory, or uses some of that area for a scratch pad, bad things can happen. With this sort of problem, it is hard to say exactly what the result will be.

One of the nice things about PC-DOS 2.0 is that it lets a program permanently allocate memory to a use. This memory need not be contiguous. Watch out for programs (particularly compilers) that will use more than 64K; the memory they use may collide with a workspace resident program (such as a print spooler or RAM-disk) which had already reserved that memory. Note that the RAM-disk which is documented in the PC-DOS 2.0 manual ("Sample Device Driver" on pages 14-27) allocates memory from the bottom; if you use this one, it cannot cause a collision.

Be wary of using the ANSI.SYS program to redefine function keys. If you do this and then run a program which expects function key answers, you may find yourself unable to exit.

A final problem: with Version 2.0 I have been unable to break out of a redirected input. Although the PC-DOS 2.0

***BY USING PATHS,  
you can run a program  
from one subdirectory  
while residing in a  
different subdirectory.***

forget that you still can copy a file from one subdirectory to another. Also, by using paths, you can run a program from one subdirectory while residing in a different subdirectory.

The new trees, piping, and redirection features have removed a few characters from the valid file name set. If you have files written in version 1.1 that include

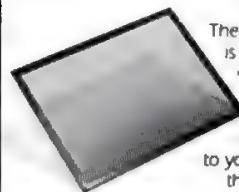
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manual claims you can hit Ctrl-Break, this has not worked for me. Since there's no other way to recover, be very certain that you use an input file that will handle all the expected questions. If you leave

pressing the Alt key and the numerical pad does not work. Can you help?

With the amount of foreign correspondence written on word processors these days, I am surprised the question hasn't come up before.

Claude Vacas  
Bloomfield Hills, Michigan

A: Actually, I have received a few questions about using foreign language character sets. Now that the IBM PC is sold internationally, this should become a very common question, so it is time for a detailed answer.

First, the problem of displaying the characters. As far as I know, the only word processing program which will display foreign language characters is Edix by Emerging Technology Consultants. Other programs, such as WordStar, tend to automatically filter out the top bit that identifies these characters. Unfortunately, Edix must be used with the companion program Wordix to get formatted copy. This combination is less convenient to use than a joint editor/formatter program.

What about printing? Almost any word processing program can print foreign language characters, even though they may

**A**LMOST ANY  
word processing  
program can print  
foreign language  
characters, even though  
they may look strange  
on the screen.

look strange on the screen. This capability largely depends on your printer. I'll discuss how to do this with two printers: the Epson FX-80 and the NEC Spinwriter 3550. You can probably use the same technique if you have a program capable of sending an Escape signal (character 27) and control characters to the printer.

The Epson FX-80 is a very nice dot matrix printer capable of printing most foreign language characters. To get it to print them, you first need to send it the

## **P**ROGRAMS which perform fancy operations on the diskette will most likely fail under Version 2.0.

out an answer you may need to reboot.

In short, if memory constraints can be eliminated, most programs which run under PC-DOS 1.1 will still run under PC-DOS 2.0. The primary change in the operating system lies in disk organization, so programs which perform fancy operations on the diskette will most likely fail under Version 2.0.

I like PC-DOS 2.0 a lot, and plan to use it in future software. For C language programmers, the new calls are excellent. It also appears that these calls will be part of Xenix; if so, PC-DOS 2.0 will provide an upward path for software developers.

## **Booting Up a RAM-Disk**

Q: I use EasyWriter II. The update which came out in January uses PC-DOS, rather than the program's own operating system. Is it possible to make use of a RAM-disk by calling the auto-execute batch program, rather than booting via Ctrl-Alt-Del?

Paul Segal  
Syracuse, New York

A: Yes, this should be possible. I believe that EasyWriter 1.1 from IBM (which relies on PC-DOS) will also run under a RAM-disk. I have requested a copy of the new EasyWriter from IUS and expect to be able to start testing it momentarily.

## **Foreign Characters**

Q: I have a need to use foreign language characters while operating WordStar 3.2. Entering the character's ASCII values by

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string Esc-"I1". In BASIC, that statement would look like:

```
LPRINT CHR$(27)+"'I1'";
```

After sending this from BASIC, you can probably even run the editor. From then on, certain control characters will print foreign language characters. If you use an Epson FX-80, refer to pages 3-73 of its users manual. It will tell you, for example, that sending a Ctrl-F (character 6) will print a British pound sign. Of course, this

## **C** **CERTAIN** *control characters will print foreign language characters.*

may display as "F" on your editor. The Epson's foreign set contains accented and umlauted vowels, and monetary symbols.

If you need letter quality printing with foreign characters, then I suggest using the NEC Spinwriter 3550 printer (this printer is also sold by IBM). The 128-character thimbles used by the NEC can contain foreign characters, as well as all 96 ASCII characters. For example, the Europe-A prestige elite 12-pitch thimble contains most of the common European characters. Convincing the NEC to print any of the thimble's additional characters may not be so easy, however.

The simplest approach is by a method called RAM Thimble Mapping. This may require you to give up a standard character for each new character you use. You might elect to have the { (brace) symbol replaced by the pound symbol. To do this, you need to refer to a thimble mapping chart (available from NEC dealers). This chart shows the position of each character on the thimble. Let's suppose that the pound sign is position 12. Then, to replace { by the pound symbol, you could send this BASIC statement:

```
LPRINT CHR$(27)+"?{"+CHR$(12)  
+CHR$(106)  
+CHR$(27)+"@";
```

CHR\$(27)+"?" initiates mapping mode. This is followed by a three byte sequence for every character you wish to have replaced.

The first byte is the replaced character,

Figure 1: A BASIC program for generating a thimble map for the NEC Spinwriter 3550 printer

```
100 REM PROGRAM TO GENERATE A THIMBLE MAP  
110 REM FOR NON-CONTROL CHARACTERS  
120 REM  
130 REM Select the RAM thimble:  
140 REM  
150 LPRINT CHR$(27)+"5";  
160 REM  
200 REM Run as two sets to avoid printing  
210 REM control characters:  
220 REM  
230 FOR J=0 TO 1  
240 REM  
250 REM Map character I+(J*64) to position I:  
260 REM  
270 FOR I=1 TO 64  
280 REM  
290 REM Enter map mode:  
300 REM  
310 LPRINT CHR$(27)+"?"  
320 REM  
330 REM Map a character:  
340 REM  
350 LPRINT CHR$(I+32)+CHR$(I+J*64)+CHR$(106);  
360 REM  
370 REM End map mode:  
380 REM  
390 LPRINT CHR$(27)+"@";  
400 REM  
410 REM Print the character:  
420 REM  
430 LPRINT CHR$(I+32);  
440 NEXT I  
450 NEXT J
```

in this case the brace "{".

The second byte, CHR\$(12), is the thimble position of the new character.

The third byte, CHR\$(106), contains a value calculated in the following way. The hammer impression level (here I use 6) is multiplied by 16. This is added to the character spacing, as measured in 1/120-inch units: for example, each 12-pitch character takes up 1/12 inch, which is 10 times 1/120 inch. Therefore, the equation to use here is  $(16*6)+10=106$ . For 10-pitch characters or proportional spacing, different values would be used. Try different values for the hammer impression level and see what the results look like on your printer until you find how to get the appearance you want. For different characters, the best hammer impression level may vary.

At the end of the thimble mapping sequence, send these two bytes:

CHR\$(27)+"@". Before this ending, you can put as many groups of three bytes in the middle as you like, to map several special characters at the same time.

You can write a simple BASIC program mapping each character (from 1 to 127) to generate a thimble map. (See Figure 1.)

If you first prevent the printing program from resetting the printer, you can use a small program in BASIC to set up the mapping sequence. Then, when you use the word processor, just remember that some of the characters you key in will be translated into other characters.

The NEC Spinwriter does not use some control characters. Therefore, when you use RAM thimble mapping, if you map special characters onto these control characters, you might be able to retain all 96 ASCII characters.

Note however, that you must map every character you wish to use. Once the



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NEC printer has received a command (Escape 5) to begin using the RAM thimble, it will look to the RAM for all characters. You therefore need to know how to map every single character.

There is, for a price, a much easier solution. The Final Word, by Mark of the Unicorn, is a word processor program that

***You MUST MAP  
every character you  
wish to use.***

makes this whole process very simple. I would suggest that you at least try the program out if you have a desperate need for foreign language characters.

## **Toggle Control Keys**

**Q:** A demonstration of the IBM PC convinced me that this is the computer I need. But I have not purchased one because I am unable to use the IBM keyboard.

To access all of the characters on the keyboard, a user must press the shift key, the Ctrl key, and the Alt key at the same time as other keys.

Because of a physical disability, I am unable to press more than one key at a time. This problem could be overcome by software which would convert these keys into toggles, such as the CapsLock is now. Since writing software to do this would require a knowledge of assembly language, which I know nothing about, I would appreciate any help.

Dal Vordahl  
Spokane, Washington

**A:** Two approaches towards solving your problem spring to mind. You could use a routine that is called by the clock interrupt (user interrupt 1Ch) to check whether or not a key was pressed. If so, it then toggles the keyboard status word at 0040:0017. This word contains bits which indicate to the keyboard routine whether the Alt key, the Shift key, or the Ctrl key are depressed. The problem with this solution is that it can only be used with programs which will not attempt to read characters too quickly.

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**CIRCLE 109 ON READER SERVICE CARD**



A second, more viable approach, is to write a small program that will replace the usual keyboard interrupt (interrupt 16h). When this routine is called to provide a keypress, it should check to see if the last key pressed, say the Alt key, is actually a signal that you wish to have

**B**ECAUSE OF A physical disability, I am unable to press more than one key at a time.

locked. For example, when the program asks for a character, it might detect that you have pushed the PgUp key. This could be a signal that all keys pressed from then on are control keys, until the PgUp key is pressed again.

The difficulty with writing this routine is that it will require a fair amount of logic to handle all of the various possible combinations of pressed keys. For example, suppose you had requested Alt mode and then pressed the left arrow key. Well, PC-DOS does not understand a character corresponding to Alt-left arrow. Despite the potential for confusion, the latter approach is probably the most effective.

For another look at computers and the handicapped please see "Helping the Handicapped Through Computers" by Dona Z. Meilach, in this issue.—Ed.

### Timeout for Buffers

**Q:** I use an IBM-PC to run packaged programs, such as WordStar and VisiCalc, as well as programs that I write myself. I use a printer with a very large buffer of 12,000 characters. The buffer fills OK, but thereafter it takes data in blocks, causing the IBM to display a "Device Timeout" error message about 8–10 seconds after handshaking begins. Can you tell me any easy way to control this?

Jim Rogers  
Orange, California

**A:** What you need to use is the MODE program that comes with PC-DOS. If you read the PC-DOS manual concerning MODE, you will find that there is a P option for printers that causes PC-DOS to never

make a timeout error. By entering `MODE LPT1:,,P`, you say that you want continuous retries for line printer 1. If you use redirected I/O (i.e. with a serial printer), then you would enter this instead: `MODE COM1:1200,e,,P`. This sets the COM1 line to 1200 baud with even parity. This would be followed by an instruction to redirect the printer to COM1, say by writing `MODE LPT1:=COM1`.

Adjust the values to suit different ports or different baud rates.

### Munching Matrices

**Q:** I have encountered a particular problem with the FORTRAN compiler for the IBM PC that does not appear to be addressed in any of its documentation. I need to work with a number of large matrices at the same time, so I wrote a program to do heavy number-crunching. My code compiled fine when I asked for data areas less than 64K, but the program would not work at all for areas of more than 64K.

I was looking forward to using the 8087 chip for number-crunching, but now I find that IBM's versions of Pascal, BASIC, and FORTRAN suffer from that same memory limitation. Can you recommend a way around this dilemma?

James Horkovich  
Xenia, Ohio

**A:** It sounds to me as if you should investigate the APL\*PLUS/PC interpreter produced by STSC, Inc. (see "PC APLication"

**I**N PROCESSING large arrays, the speed of interpreted APL is equivalent to a compiled language.

in PC Volume 1, Number 11). It is the only compiler/interpreter I know of which will support more than 64K of data and the 8087. Note that it does have a 64K restriction on data object size.

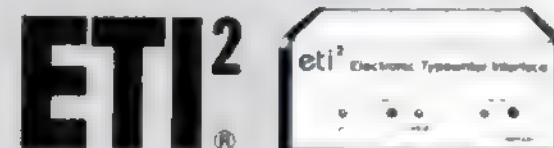
From the description of your applications, it sounds as if APL would suit your needs better than the languages you suggested. In processing large arrays, the

# PRINTER OPTIMIZER



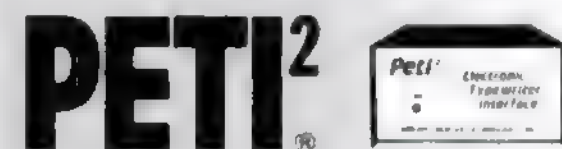
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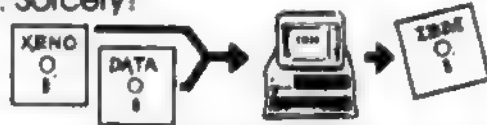
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speed of interpreted APL is equivalent to  
(or faster than) a compiled language.

I hope that IBM releases a new FOR-

wrong place, out of order.

I also seem to be able to get some dupli-  
cate line numbers.

Another problem is with the printer. I  
use a serial printer and it works fine in  
everything but BASIC. Is there an easy  
way to get it to work in BASIC?

Marvin Konopik  
San Francisco, California

## THE APL\*PLUS/PC interpreter will support more than 64K of data and the 8087.

TRAN compiler that does not contain  
these deficiencies, but there have been no  
reports of plans to do this. Not only does  
IBM's FORTRAN handle no more than  
64K, but it also lacks double precision.

### Mysterious Lines

Q: I seem to be having difficulty with  
BASIC. I get syntax errors in lines that are  
perfect; when I retype the lines, every-  
thing works fine. I also have written lines  
which refuse to be inserted. Even when I  
use the BASIC command to renumber the  
program, these lines will show up at the

A: Don't feel alone. I have seen commer-  
cial BASIC programs with duplicate line  
numbers. The problem and its solution  
are really quite simple, once you know  
what to look for.

When you end a line in BASIC, a mark-  
er is inserted that BASIC uses to tell the  
difference between two separate lines and  
one line that is over 80 characters. The  
marker used is character number 255.

When you have a numbered line that  
won't go to its correct sequential position,  
what has happened is that it is part of  
another line that may be, say, 160 charac-  
ters long. Take a look at the following  
example, where I used the # symbol to  
represent the marker character 255 (the  
actual symbol is blank).

10 REM This seems to be a short  
line

#

If you later enter a program line just

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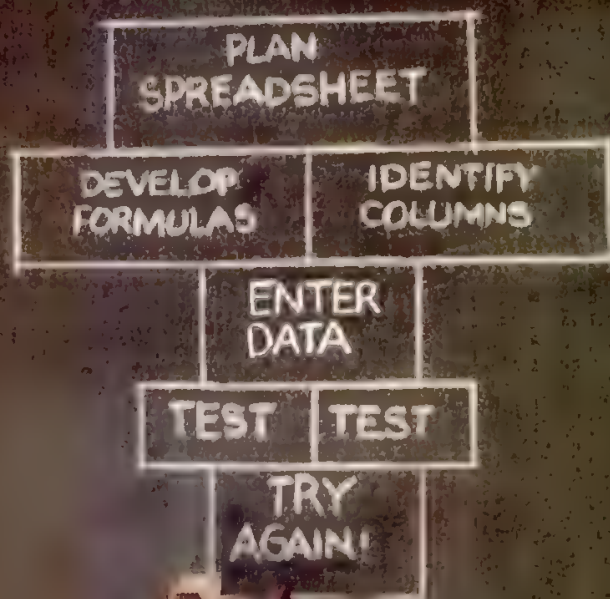
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below the line labelled 10, the new line just becomes additional material at the end of line 10. For example, suppose you enter the following:

```
10 REM This seems to be a short  
line  
200 Y=X-4
```

#  
It will look like everything went OK, but you will find that "line 200" does not exe-

**I** HAVE SEEN  
commercial BASIC  
programs with duplicate  
line numbers.

cute and will always appear right after line 10, even if you renumber, or type over it. The "200 Y=X-4" is just treated like a continuation of the comment on line 10.

To stop yourself from falling into that trap, there are two outs. First, move the cursor to line 10 and hit the End key. This will move the cursor to the 255 character (usually blank, but shown as # in the examples above). If the marker is at the end of the following line, you can see that line 10 is actually two lines long.

Another solution is to move the cursor to the line you plan to type on and then hit the Escape key to a line. If it erases existing text, then you stopped yourself from making a mistake by leaving unwanted characters on that line.

As to your problems with printing from within BASIC: Although you can use the PC-DOS MODE command to redirect printed output to the serial device, this command is not sensed by BASIC. That deficiency has been corrected in PC-DOS 2.0, so you might wish to upgrade. Otherwise, to print from BASIC with PC-DOS 1.1 you must open the COM1 device (like a file) and write to it, just like using file I/O. This is the correct method, but it's extremely clumsy. /PC

The PC Tutor will solve your practical problems and explain matters of general interest. If you would like to see answers to your questions, drop a line to PC Tutor, PC Magazine, One Park Ave., New York, NY 10016.

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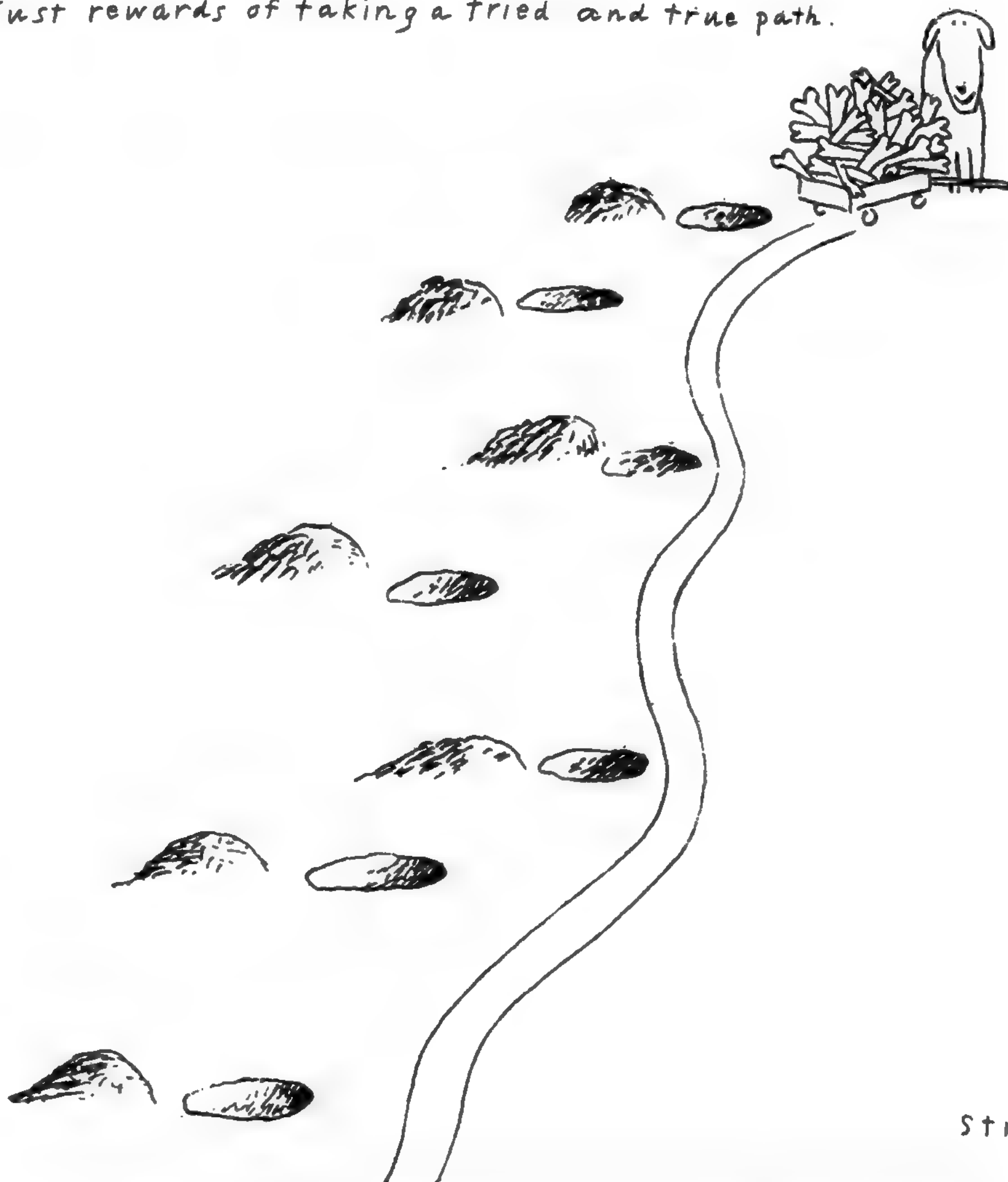
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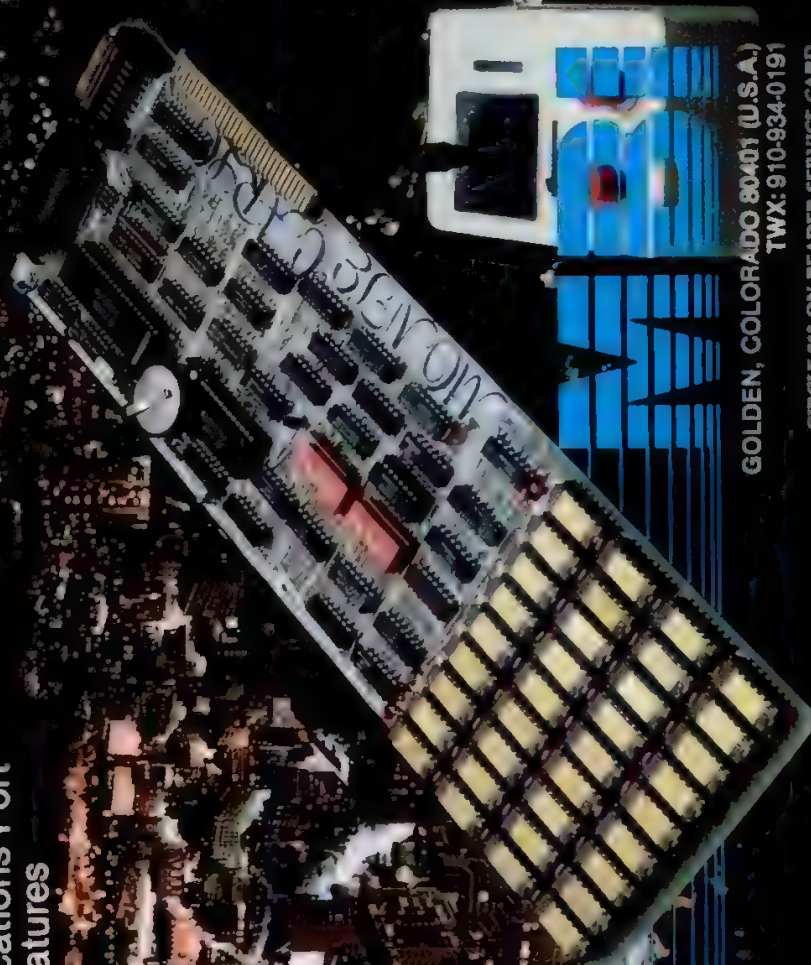
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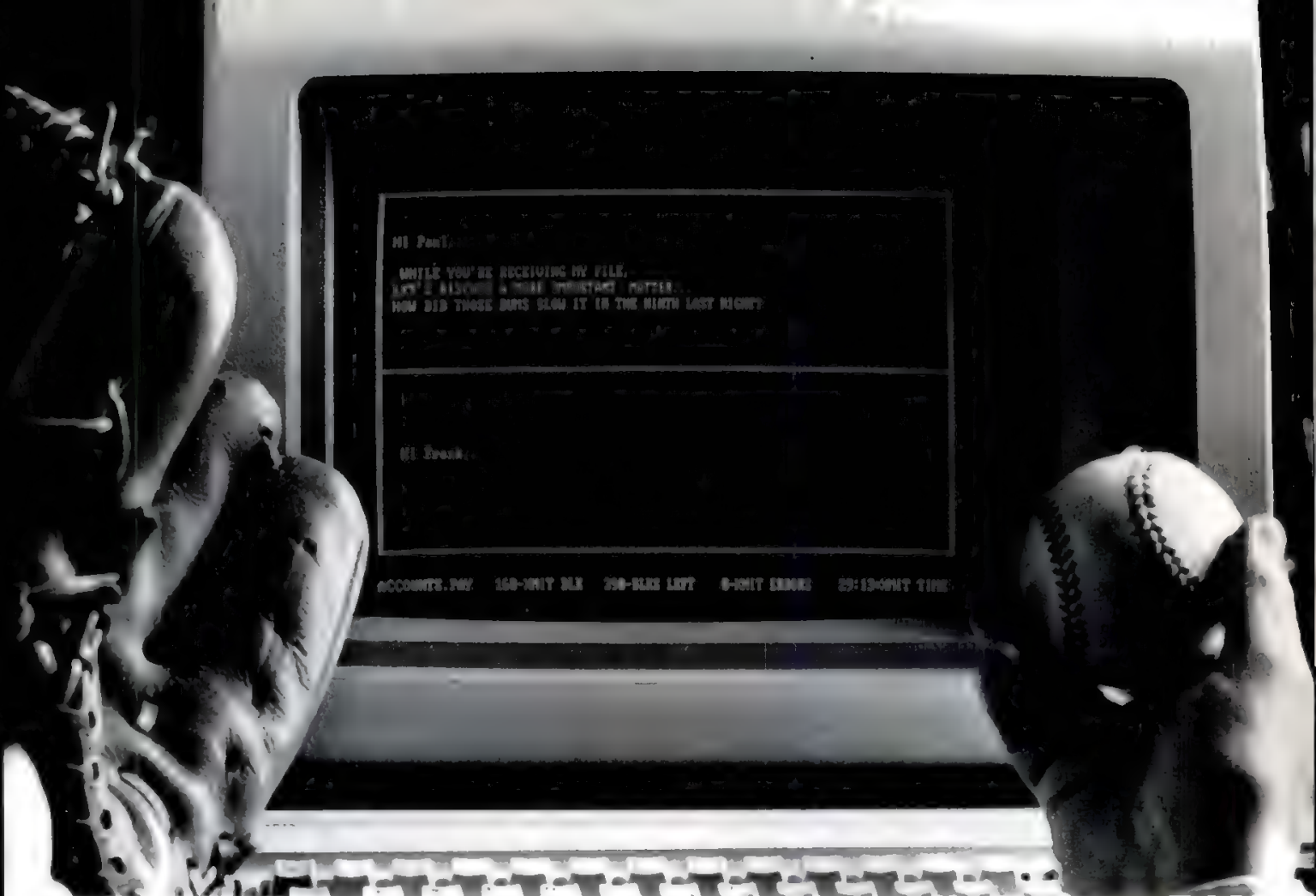


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And now there's finally a way to learn about and try out all of these products: PC '83, the first international event *exclusively* for PC users.

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The program features world-renowned PC authorities speaking at over 100 educational sessions. Seminars provide an in-depth, understandable look at a broad range of PC uses in business, home and education. Seminars emphasize 'how to,' telling you specifically what you need to know—in non-technical language—to use the PC in dozens of different applications.

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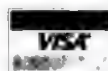
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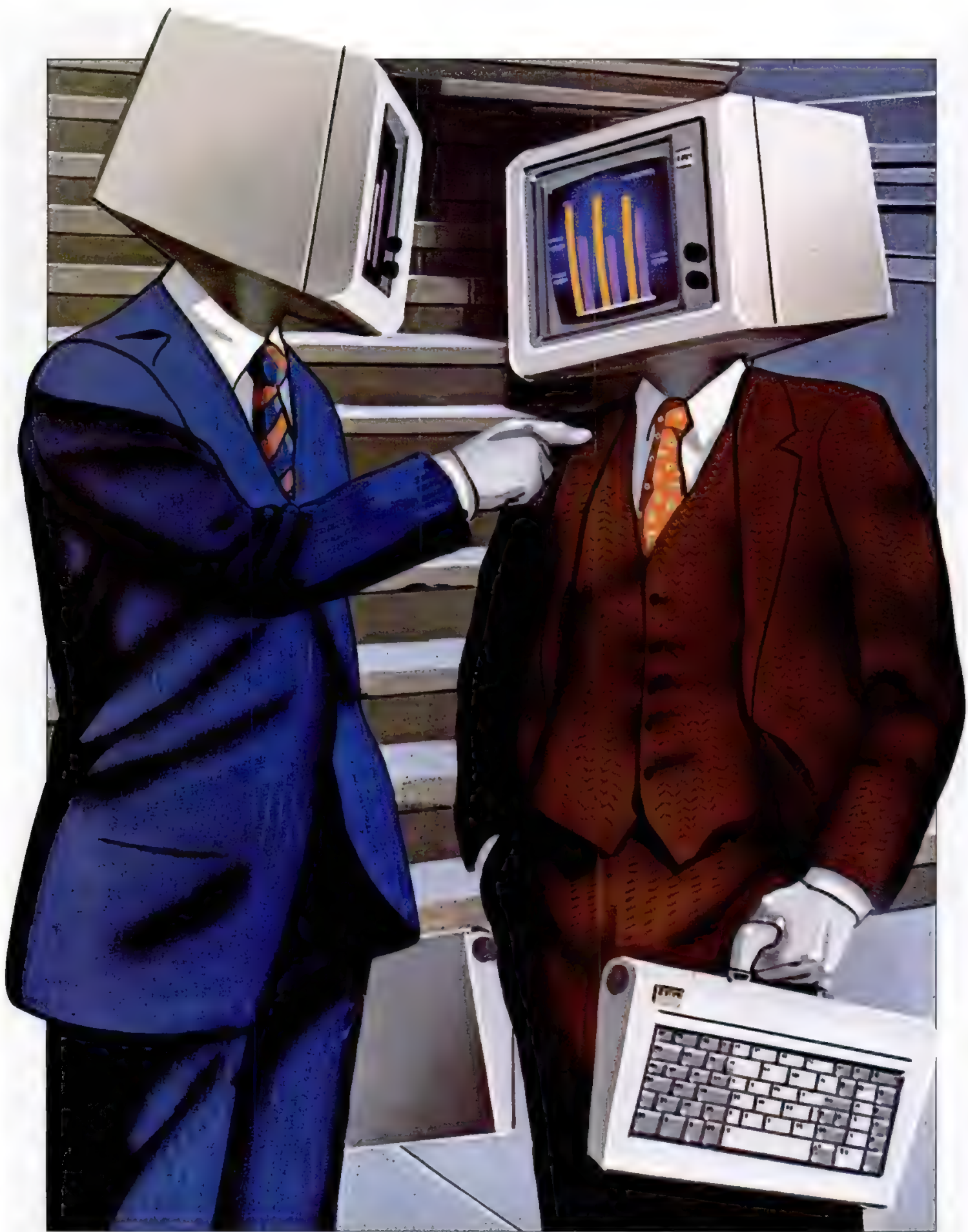
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service that will provide your IBM PC

with an immediate and open channel to  
the trading floor of the major stock  
exchanges. Now your PC can be used as  
a communications device to place the  
most direct buy and sell orders in the  
securities industry.

Stock market information has been a  
popular commodity for many years. The  
stock pages are a main part of any major  
daily newspaper. Stock reports were  
among the first information items vended  
by The Souce, CompuServe, and other  
electronic information utilities. The Dow  
Jones News/Retrieval Service provides  
stock information as its main stock and  
trade. But these utilities share several  
common shortcomings: first, their num-  
bers come from a delayed stock ticker.  
This information is officially delayed 15  
minutes, but on heavy trading days when  
you may really need the details, the ticker  
can become backlogged with data.

The second shortcoming of the infor-  
mation utilities is that they are nothing  
more than providers of information. They



don't really help you do anything with the information when you get it.

The Trade\*Plus service gives you stock information in a format personalized to meet your own needs and it provides the ability to quickly and directly do something with the information you receive.

## THE TRADE\*PLUS system provides an electronic conduit between you and a stock broker.

Trade\*Plus is an on-line computer service. If you have a modem to connect your PC to the telephone line, you can call the Trade\*Plus host computer. The connection between your local telephone exchange and the Trade\*Plus machine is made by the Telenet packet switched network; this part of the link is essentially invisible to you.

You can dial into the system from any type of ASCII terminal. If you use an IBM PC, you can take advantage of the Trade\*Master software sold by Trade\*Plus to format and record your on-line sessions. A program turns the PC into a smart terminal able to automatically dial Trade\*Plus, sign you onto the system, and

perform the first inquiry operations.

### Services and Reports

Once you are signed into the Trade\*Plus system, your PC will ask the host computer for a current status report on your preselected list of up to 18 stocks. If you have obtained the Trade\*Plus Last Trade option, you will see information based on the latest sale of each issue. This database is constantly updated through high speed circuits connected directly to the computers of the New York and American Stock Exchanges. If you take the Last Trade option, however, you must sign a special agreement with the exchanges and pay them an additional monthly fee. If you do not use the Last Trade service, the information you receive will always be 20 minutes old, but never any older. This is the same high-speed data used for Last Trade, but Trade\*Plus holds it for 20 minutes in its computer to honor its agreements with the stock exchanges.

The Trade\*Plus computer provides business-oriented reports on your stock portfolio; the reports include the facts and figures referred to as the fundamentals. These are not the detailed histories and graphs used by the group of trader-analysts known as "chartists," who look for patterns in the history of stocks and try to predict the future from the past.

Trade\*Plus does not provide the data needed for the historical analysis of a security.

Trade\*Plus does provide the kind of reports that bankers, accountants, and tax auditors like to see. You can see your portfolio of investments in both detailed and summary form. The prices and values are current, so you know what your financial position is almost moment by moment. You can add investments made outside the Trade\*Plus system (bank certificates of deposit, for instance) and the portfolio function will track them for you so you have a complete financial picture.

The Stock Watch feature on the Trade\*Plus menu allows you to watch the detailed movement of an individual stock or the price movement of a group of stocks of your choice. Selecting the Tax Report from the menu provides you with a summary report, which tells you the current status of your long and short term gains, and a report telling you the potential long and short gains and losses you have in your present portfolio. I found the ability to know my exact status and to make "what if" projections was much more useful than finding out whether a stock had taken certain dips or leaps in the past.

Other Trade\*Plus reports provide a log of transactions you made through the system over the previous 90 days and all your orders that await execution. All orders, order cancellations, order expirations, and trades are listed by date in the log.

The Trade\*Plus system provides an electronic conduit between you and a stock broker associated with the service. The service provides electronic mail between you and the broker for both free form messages and specially controlled electronic order forms you use to buy and sell securities. The order forms require secondary passwords that provide a double layer of security so that someone gaining access to your program disk can't trade on your account.

Trade\*Plus should be an invisible conduit between you and the broker at the other end of the system. The only time you should be aware of the service is when you pay its separate charges on your credit card bill.

### The Broker's Role

Since users of this service are, of course, concerned with money, it's worth

```

***FILE NAME TO READ: B:trade
111
- 111 STOCK WATCH -
- Last-Sale Prices -
- 02:55 PM EST 4/07/83 1112.62
# STOCK CURRENT CHANGE TRND LIMIT
1 NCR 105 3/4 - 1/4 DN
2 IBM 102 5/8 - 1/8 UP
3 XON 30 3/4 + 1/2 DN
4 DEC 117 1/2 - 3 1/4 UP L
5 GD 41 1/2 - 1/2 DN L
6 WANB 31 3/4 - 1/4 DN L
7 EFH 47 3/8 + 1/4 DN
8 XRX 40 1/4 - 1/8 UP
9 WCI 27 7/8 ..... DN
10 JCP 59 1/4 + 1 ..... DN
11 DIS 78 1/2 ..... DN
12 S 35 1/8 + 5/8 UP
13 HWP 78 1/4 - 3/4 UP L
14 CBS 00 ..... DN
15 BAL 33 3/4 + 1/4 DN
*** END OF PAGE-TYPE THE RETURN KEY TO PROCEED

```

This Trade\*Plus screen shows the current status of a portfolio of securities. It allows you to quickly compare the current price with the price you paid for the stock. This detailed listing is not updated while it is on the screen.

```

*** FILE NAME TO READ: B:buffer2
*** TYPE NUMBER TO SELECT ... 211
- 211 BUY OR SELL STOCKS -

*** Type Stock Symbol..... IBM
INTERNATIONAL BUSINESS MACHINE
Last-Sale Price is..... 103
*** Type (Buy or (Sell)..... B
*** Type Number of Shares..... 100
*** Type (Market or Bid Price..... 101 1/2
*** Type (G)TC, (D)ay, (S)top Buy..... G
(C)ash, (M)argin, (O)ption
(S)hort, (K)eogh, (I)RA
*** Type Account (C)MOSKI..... C
*** Type (B)ull or (D)ebit Fund..... B
*** Type (H)old or (D)eliver Cart..... D
*** Type Password..... XXX

YOU MUST STAY ON-LINE FOR CONFIRMATION
***END OF PAGE-TYPE THE RETURN KEY TO PROCEED

```

This is the order form used to enter a buy or sell order. You need a separate password to complete this form. The system supplies the last sale price; to complete delivery you enter the price you wish to buy or sell at and add a few other details. The price you enter must be within a certain range of the present price or you can choose to accept the present market price. The (G)TC option means good until cancelled.



considering what Trade\*Plus costs and what you get for your money. Keep in mind that the charges for the Trade\*Plus services are completely separate from any brokerage fees and other money paid or received in the transfer of securities. Many brokers simultaneously offer their services through Trade\*Plus. Trade\*Plus plans to expand its list of available brokers. Any of your business arrangements relating to establishing a securities account will be made with a broker and not with the service itself.

By viewing how stocks are traded today, you can see where Trade\*Plus fits in. When you want to buy or sell stocks, you now probably pick up the telephone and dial the number of a brokerage house where you have an account. You ask for the account manager assigned to you and hope that he or she is not busy with another

client. This account manager, a representative of the broker, links you with the trading activity on the stock exchanges.

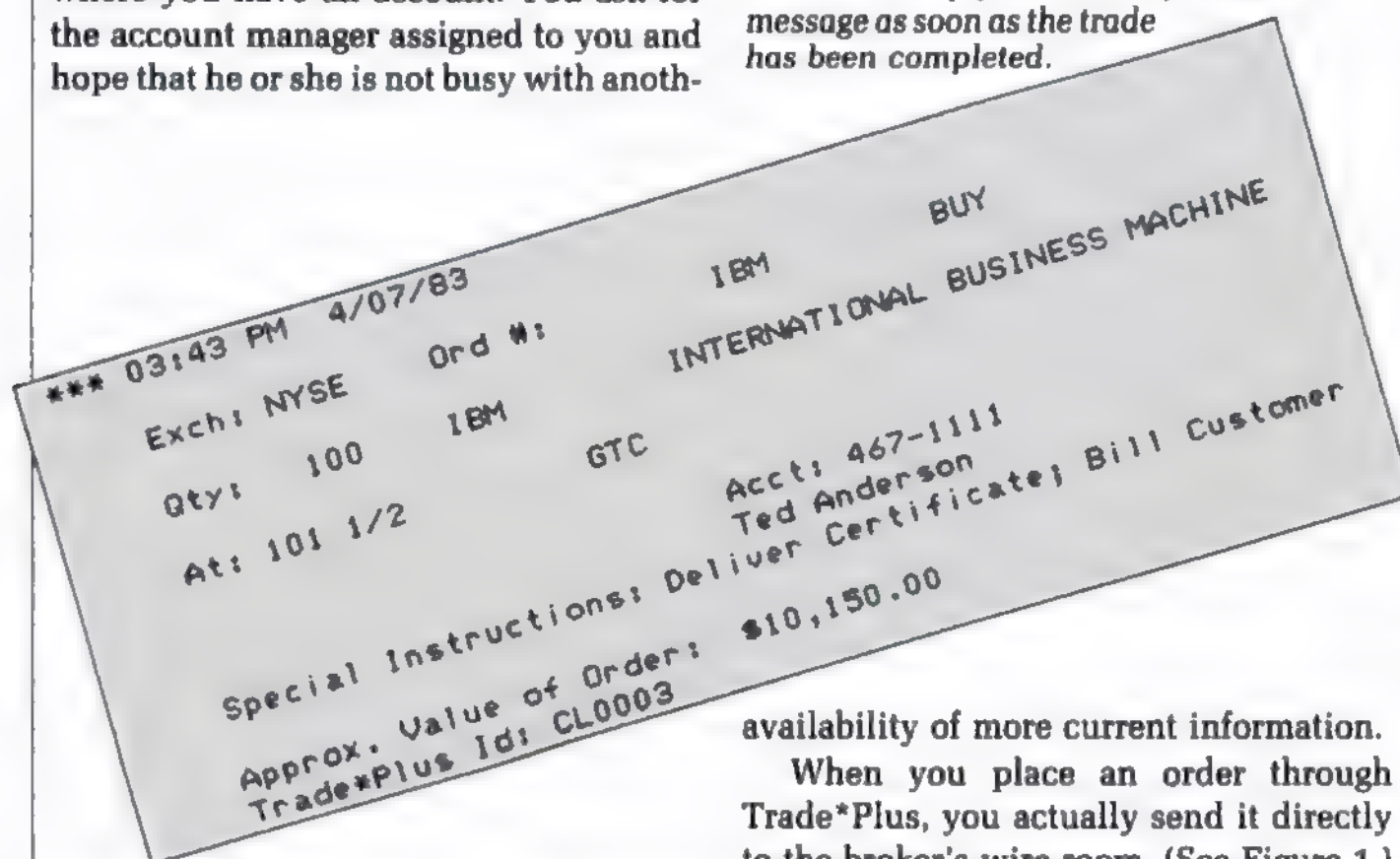
### Direct Orders

you will learn the details of the trade only when a statement or other paperwork arrives in the mail.

Trade\*Plus provides a communications link between you and the brokerage house, but it must provide more than that to justify its cost, which is higher than the old method of using voice telephone conversations with a sales representative. It must provide value-added services.

The primary advantage of Trade\*Plus over the telephone system is its record-keeping capabilities. The secondary advantage is in the service speed and the

Figure 1: This is the actual message sent to a broker by the Trade\*Plus computer. The broker will reply with a confirmation message as soon as the trade has been completed.



availability of more current information.

When you place an order through Trade\*Plus, you actually send it directly to the broker's wire room. (See Figure 1.) When the order is executed, a message will be sent directly back to you with the details. This transaction is usually completed in about five minutes. You can

**I WATCHED IBM  
move between 101 and  
103½ in a period of ten  
minutes.**

place an order, then either sign off the system and check back later in the day or stay on the system until the report is returned. Once the report is returned, Trade\*Plus automatically enters the data into your

account's files. Immediately, you can see the effect of the trade on your portfolio value, what it has done to your tax report, and a log file report that tells exactly what was done and when.

**WHEN YOU  
place an order through  
Trade\*Plus, you  
actually send it directly  
to the broker's wire  
room.**

### Costs and Charges

These value-added services are not free; there has to be a profit for the provider of such a service. To use Trade\*Plus, you have to pay a one-time registration fee to establish an account on the system. Then there are connect time fees and a fee to buy the optional Trade\*Master software. If you want the actual last price at which a security traded, you will have a separate monthly charge for this service from one or both of the major stock exchanges.

The registration fee for Trade\*Plus is \$100. This fee establishes you on the system as a user. The connect time charges range from \$29 an hour for 1200 baud service during the prime hours in your local time zone (7 a.m. to 6 p.m.) down to \$8 an hour during non-prime hours. Trade\*Master software sells for \$200. The American Stock Exchange will charge you \$11.65 a month for Last Trade price information, while the New York Stock Exchange charges \$63 a month for similar information from the "big board."

Obviously, the charges you incur for the use of Trade\*Plus are determined by many factors. If you are satisfied by a service with only closing prices and 300 baud transmission, you can manage a nice portfolio for \$8 an hour. Your actual time on the system, even at this lower speed, can be as little as 10 minutes to check a portfolio and place an order. If you do this once a week, you won't even use up the \$10 monthly minimum service charge. If you want more current data, you must



spend a minimum of \$22 an hour to get 20-minute-old prices at 300 baud.

If you have a good terminal program, such as Crosstalk from Microstuf, Inc. or PC/InterComm from Mark of the Unicorn, Inc., you will not need the Trade\*Master disk. When you are figuring the cost of Trade\*Plus you should note that you won't need to spend \$200 for this software

---

**N**EW YORK  
*already can't find  
enough ticker tape to  
have a decent parade.*

---

if you already have another capable program on hand.

Certainly, considering the monthly charges, only professional portfolio managers would find the Last Trade service economical. When I had a chance to use it, though, I was amazed to see the actual movement in the prices of some relatively conservative and high priced stocks. I watched IBM move between 101 and 103½ in a period of ten minutes. If you could buy several hundred shares of such a stock, you would pay for a month's subscription to the Last Trade service with one transaction that was properly timed to catch the small price change.

#### Trade\*Master Software

The Trade\*Master software is a communications package designed for use with the trading system. Its configuration utility program will customize the main communications program for the system identification, password, and initial selection you'll use on the Trade\*Plus service. You can also include the telephone number of your local Telenet entry port; Trade\*Master can command a D.C. Hayes Smartmodem, a Ven-Tel PC Modem Plus, or a U.S. Robotics Autodial modem to dial this number automatically. It will then interact with Telenet and sign you onto the system.

Trade\*Master has a very complete sign-on routine. You do not need to do anything after you boot up the disk. It makes communications operations about as nontechnical and invisible as possible.

Typing Ctrl-Z during the operation of the program provides a menu of options: you can save the incoming data in a capture buffer, write the buffer to a disk, read disk files, and print disk files. The capture capability means you don't have to spend a lot of time on the Trade\*Plus system reading and pondering over the data. You can capture a snapshot of your portfolio in the buffer, write it to the disk, and leave the system. Once you are off-line, you can bring the data up on the screen or print it out later for study.

Trade\*Master can be used as a general purpose communications program, but it is specifically configured to perform the Trade\*Plus sign-on. Crosstalk and other communications programs can store your passwords and dialing codes so you can enter a system like Trade\*Plus with about three keystrokes, but they do not offer the "hands off" performance of Trade\*Master. They do, however, cost less and have greater flexibility for use with other systems.

#### The Time Has Come

Since the idea of electronic stock trading must have occurred to others, why is Trade\*Plus the first such service? Other

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**E**LECTRONIC  
*trading could make the  
entire system of frantic  
activity on the floor of  
the exchange obsolete.*

---

information utilities sell material goods through special buying groups and on-line stock information is popular, so why has electronic stock trading taken so long to arrive? Every time I asked this question, I got a different answer.

Some experts in the field said that the profession's account managers have killed the idea before, and might kill it again, because they feared losing their jobs. Other observers pointed to the conservative nature of the whole industry. After all, the concept of electronic trading, if carried only a few steps further, could make the entire system of frantic activity on the floor of the exchange obsolete, eliminating

the mystique of Wall Street and a lot of jobs. These observers point out that New York already can't find enough ticker tape to have a decent parade because computer

---

**I**F THE BROKERS  
*smell money, they will  
break like bulls for  
water.*

---

systems have replaced the stock ticker. If you develop direct electronic trading, customers may not need the middlemen.

Somehow, Bill Porter prevailed over this logic and made Trade\*Plus the first electronic stock trading system for the use of private individuals. It certainly will not be the last.

#### Putting Stock in the Future

I think predicting the future of the electronic securities trading industry is easy. Monkey see, monkey do, and devil take the hindmost. If the brokers smell money, they will break like bulls for water.

The impact on the microcomputer industry will be interesting, too. Competition between brokers should lead to improved electronic performance, making data retrieval and remote interaction more automated and less burdensome.

I believe we will quickly see the "hands off" capabilities of programs like Trade\*Master taken one step further and integrated with software like VisiCalc, dBaseII, and Lotus Development Corp.'s 1-2-3 information management program. If this kind of automated communications program could be selected for 1-2-3's menu, you could enter Trade\*Plus to update your portfolio information, capture it in a 1-2-3 file, and use 1-2-3's manipulation and graphing power on the captured portfolio data. You wouldn't be concerned with the fact that your computer had just consulted with another machine across the country to get the data.

The microcomputer field is moving towards this sort of integration, and services like Trade\*Plus will act like magnets to draw it there. The total information age is coming very quickly. Ticker tape may soon be a thing of the past. /PC



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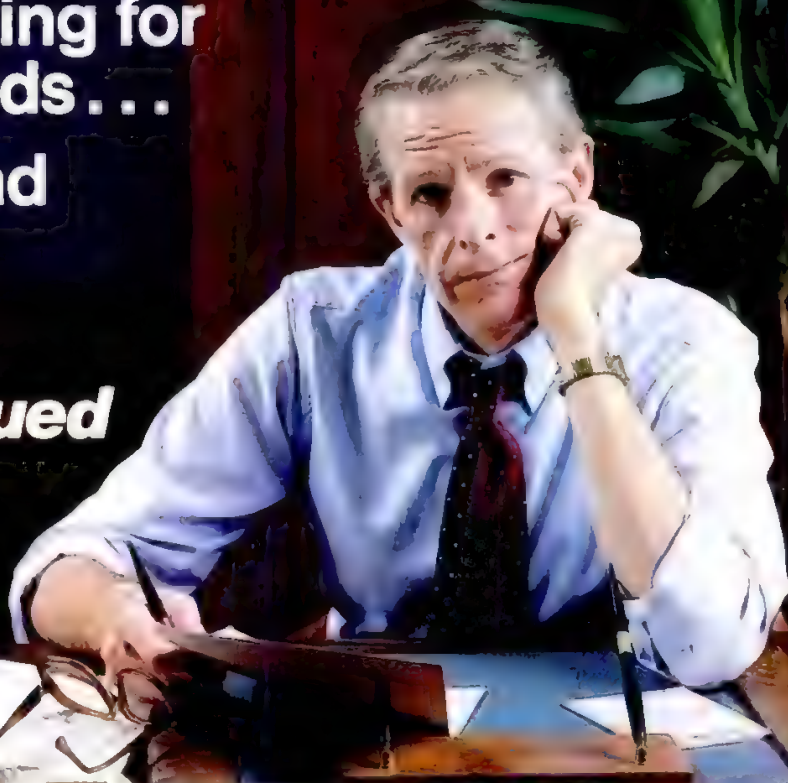
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waiting, and  
waiting...**

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P-3



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CIRCLE 201 ON READER SERVICE CARD



*This database management system brings many capabilities—and a taste of the pricing—of mainframe software into the PC environment.*

# MDBS THE THIRD: IF YOU HAVE TO ASK THE PRICE . . .

---

**MDBS III**  
International Software Enterprises  
ISE-USA, Inc.  
85 West Algonquin Rd., #400  
Arlington Heights, IL 60005  
(312) 981-9200  
**List Price:** \$2,800—up, depending on options  
**Requires:** 128K RAM, (hard disk recommended).

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CIRCLE 623 ON READER SERVICE CARD

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**W**hy would anyone buy a \$9,976 piece of software for a \$4,000 computer? Well, as the old saying goes, "You can pay me now or you can pay me later."

MDBS III is a database management system, available for the IBM PC in versions priced from \$2,800 to nearly \$10,000. You could pick up other database packages for a lower price, but you wouldn't get all the MDBS III features for any less. This package is a descendant of software used on large mainframe computers. It's powerful enough to move the

PC from the world of Personal Computing into the realm of Professional Computing.

Routines in MDBS III provide powerful mathematical functions, encryption, informal queries, careful filtering and checking of data coming into the database, and the ability to serve multiple and even simultaneous users. It was written by

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**M**DBS III IS  
*powerful enough to  
move the PC into the  
realm of Professional  
Computing.*

---

Micro Data Base Systems, a software research and development firm, in a mixture of C language and assembly language. Versions of MDBS III are available for a wide range of machines (both micro- and

minicomputers) and operating systems (including CP/M, MS-DOS, UNIX, and TRSDOS). Applications programs using MDBS III can be easily transported between different hardware environments.

If you still are outraged that a program could cost more than the computer that runs it, consider some of the differences between mainframe and microcomputer software. The total life cost of a typical mainframe system breaks down to 20 percent for the hardware while the software is 80 percent of the price. Although microcomputers have not been around enough years for us to see what their total life-cycle costs are, it appears that the greater relative sales volume of software for microcomputers has resulted in a significantly different hardware/software price ratio. Some microcomputer companies appear to give away software to sell their systems. Microcomputer users are accustomed to finding very powerful programs sold for less than one-tenth of the cost of the hardware they have.

The microcomputer marketplace has changed more than just the price of soft-







Figure 1: Summary of features of MDBS III.

Number of files: 16  
 Number of records per file: 65,535  
 Number of bytes per record: 65,535  
 Number of fields per record: 255  
 Multiple data types with checking  
 Checking for "reasonable" data  
 Multi-level Boolean record sorting  
 Automatic record maintenance  
 Boolean update of multiple records  
 File merging capabilities  
 Encryption  
 Security passwords  
 Portable to other hardware  
 Supports multiple and simultaneous users  
 Data Description Language  
 Data Manipulation Language  
 Query Retrieval System for inexperienced users

ware. The use of microcomputers by many noncomputer professionals has forced programmers to bury their sophisticated code beneath levels of simple commands and helpful screens. The world of large-scale computers is starting to be influenced by this same trend, but many years will have to pass before the mainframe data processing systems used by professionals can qualify as "user friendly." Software for mainframe systems is generally difficult to write and frequently makes demands on the knowledge, experience, and patience of its users.

MDBS III is a product of this mainframe environment. Even press releases for it are ponderous and technical. Consider this recent bit of promotional copy: "Both passive and active locking is supported for record types ... and user conflicts are managed by a contention count protocol. The architecture not only supercedes older technologies, it subsumes them."

The average editor would give a press release like this about 2 milliseconds of attention. Most microcomputer users would be baffled by these sentences—and rightly so! The point to be made is that MDBS III is not aimed at the average editor or user. This is powerful and sophisticated software targeted for sophisticated and experienced programmers and developers. If you fit this description and have difficult database management problems to solve, or if you're simply curious, you may want to hear more about the features of MDBS III (see Figure 1).

## Data Relationships

Database management systems are usually classified according to the way they arrange relationships between items in the database. Different names have been attached to various data relationships. You may have heard of "hierarchical," "linear sequential," "shallow network," and other database arrangements. The current buzzwords in databases are "relational structure." While this professional terminology has filtered down to the personal computer field, keep in mind that real DBMS experts consider most database programs available for microcomputers to be little more than "file managers."

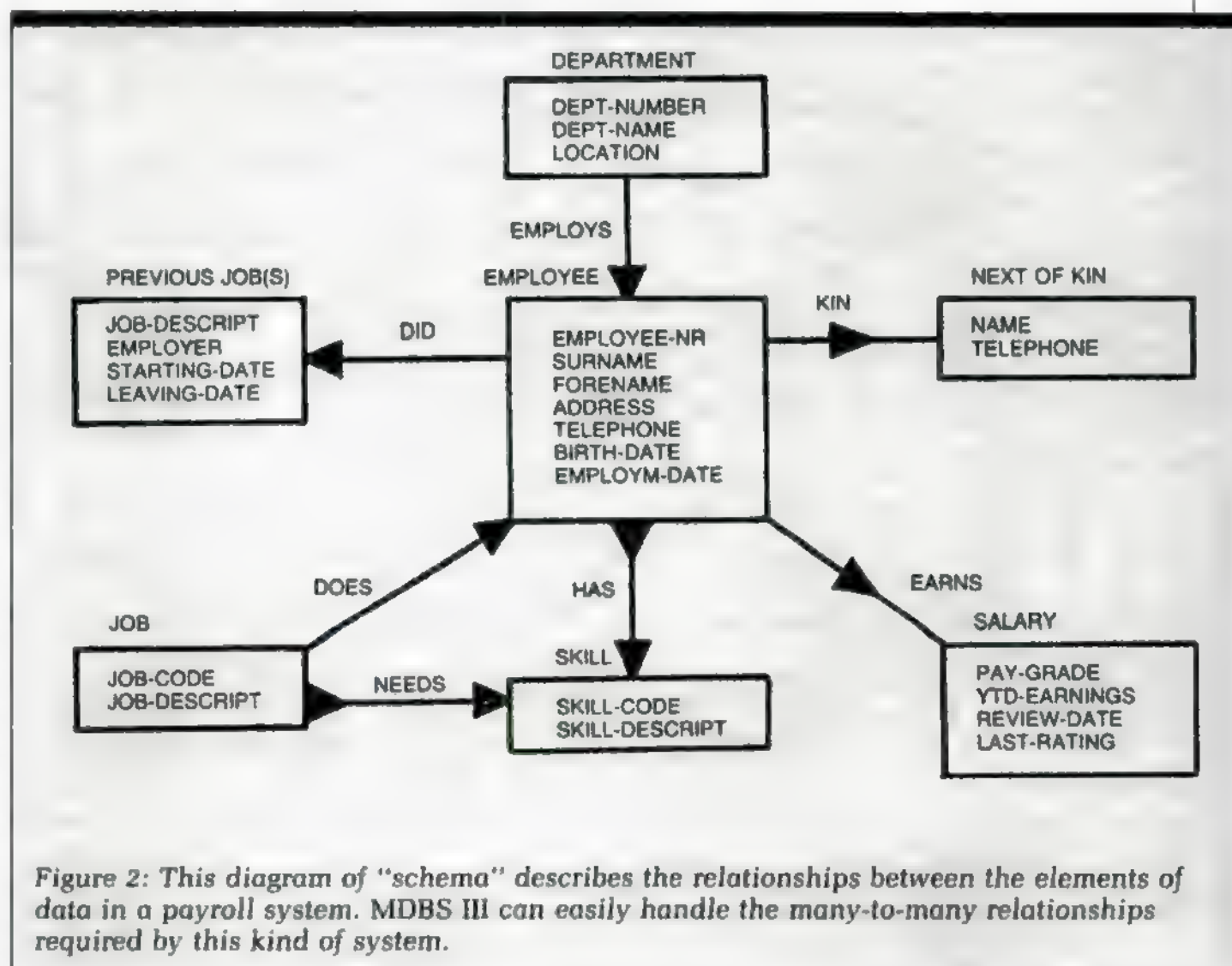
File managers are essentially sorting devices. When you use a file management program to retrieve data, it shuffles the records in its files and sorts them according to one or several specifications. Suppose you were trying to get data from the card catalog of a large library. The entire

set of reference cards is arranged by author. If you wanted to find all books with a length of more than 300 pages, you would have to look at cards to set aside those representing books of the desired length. This sorting method is effective, but it takes a while to do.

Your job would be made easier if the first card you found for a book with a length of 300 pages provided you with a list of all other books with the same or greater length. You could simply use these references to effect nearly immediate results. One drawback of such a system is that the effort of updating the cards is multiplied when several types of order must be maintained. You would need an automated system that could set all pointers to show the way to the next reference.

MDBS III is described as a "post-relational" system. (In the esoteric terminology of database management, it could also be said to have an "extended network

**M**DBS III IS  
*sophisticated software targeted for experienced  
 programmers and developers.*





structure.") The program can track and update many different relationships between the sets of data. The extended network has the ability to use and model relationships between data elements much as they are in the real world (see Figure 2). A developer can almost scribble a diagram on the back of an envelope with circles and arrows, and put it directly into the database. He may improve on the model later, but he can start building it without the constraints and artificial relationships required by many other database systems. If you try thinking of the circles and arrows used in a diagram describing a football play, and at the same time consider the complex relationships between the players, the field position, the down, the score, the time, and many other factors, you'll have an idea of how complex a data scheme could be built into an extended network database management system, such as MDBS III.

If we used one of these systems in our library example, the first catalog card you found that listed a book with over 300 pages would point to one or several similar cards. If you were to enter a card for a new book with over 300 pages, a cross-referenced relationship would immediately be established between the older cards and the new entry. This kind of structure can be searched through very quickly; if the software is powerful enough, it can be updated quickly too.

Making available this kind of sophisticated power is only the first step in the creation of a real database management system. System implies that many other capabilities and utilities must be part of the program package.

### Data Description Language

MDBS III has many parts. The names of these pieces are imposing, but their functions are easy to understand. The first software module you encounter if you create a database with MDBS III is the Data Description Language. This is an actual high order language (independent of others, such as BASIC), that the database designer uses to describe relationships between different records in the database.

The Data Description Language module automatically creates a file called a "data dictionary" that stores all of the relationships between sets of data. The presence of this dictionary makes it possi-

ble to change the structure in a practical manner. If every separate record had to be marked with all of its references, a database would soon be very large and changes would be difficult to make. The data dictionary allows the program to access one common point for information on how the records relate to each other.

You have to learn how to use this Data Description Language just as you would learn to use BASIC or Fortran. The language has 86 key words that are commands or definitions. Many of the key words can also be used in shorthand forms. One of the first commands you use in the Data Description Language is the one to enter the name of the database. This could be keyed in as DATABASE NAME IS XXXXX or DB NAME IS XXXXX. Other key words have similar shorthand forms.

The Data Description Language contains several features designed to aid the user, including an editor and syntax checker. If the syntax checker can't make sense of an entry, it will tell you before you actually try and run the program. The editor will help you change an entry without excessive retyping. The language allows for free-form comments, so it's easy for programmers to leave good notes to explain what they did—or at least what they tried to do.

### Features of MDBS III

When you use the Data Description Language, you must be aware of the technical limits and capabilities of the MDBS III package. The following are some important technical features of its database module.

1. Up to 255 different types of records are allowed in each database. A public library might use these record types: biog-

raphy, fiction, non-fiction, science fiction, etc.

2. The records can be of variable length, but you can also set the program to insure that all records are a fixed length.

3. Each record type can have up to 65,535 different data items (fields) per record type. This means that one record in a library's database could handle enough fields for 65,535 science fiction authors, assuming that enough disk storage was available.

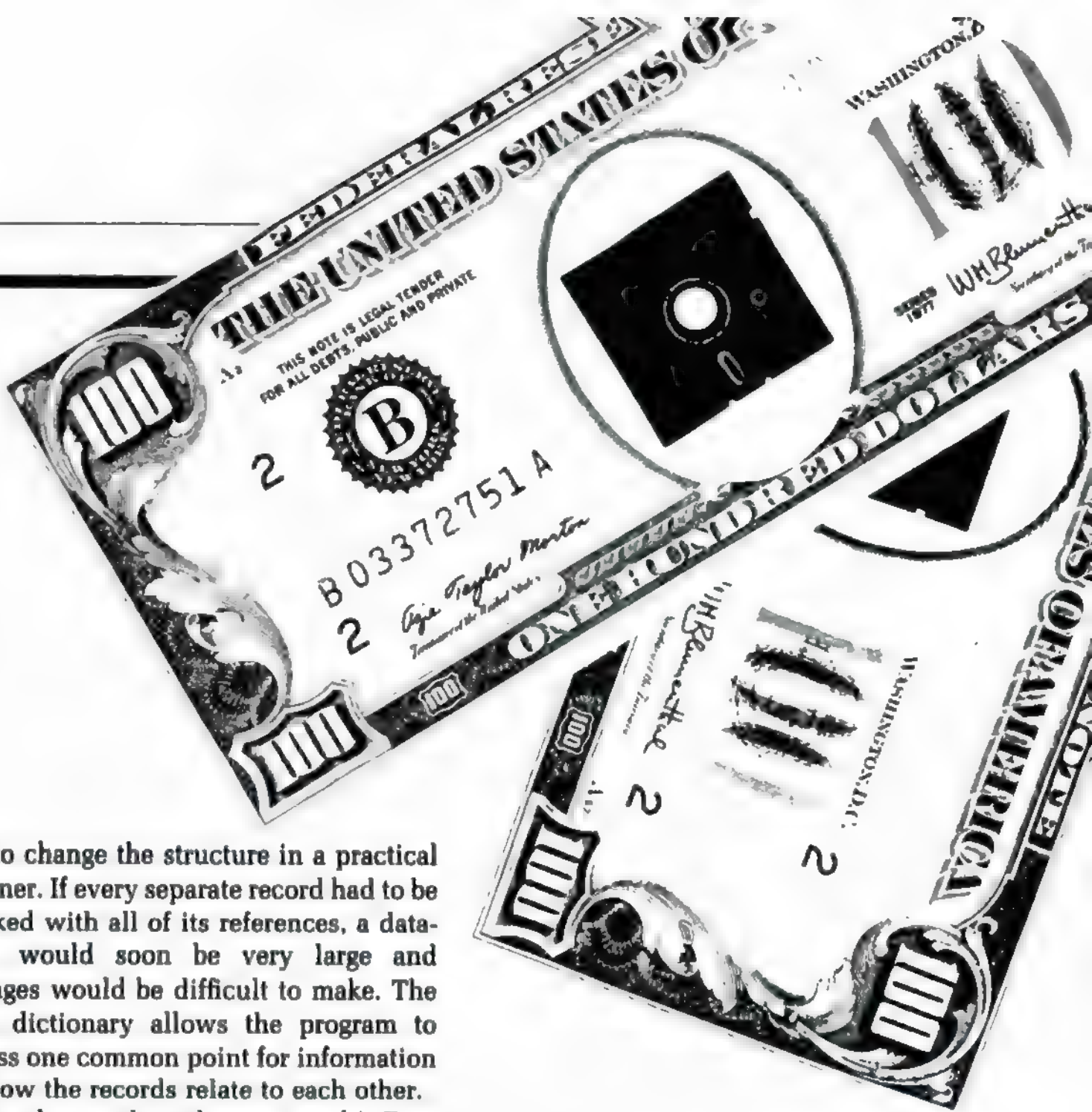
4. Data items can be ASCII characters, floating point numbers, mixed numbers and letters, binary numbers, set decimal numbers (i.e., for dollars and cents), time, and date. The program will check for the correct format of data as it is entered.

5. The data files can be encrypted and decrypted by a method that treats the user's access code as an encryption guide. This means that each user can have a completely private file and that some users can be restricted from accessing certain parts of the database.

6. As data is input, it can be checked by the program to insure that it falls within a range specified for valid data.

7. Records can be labeled with keys for one-to-many, many-to-one, one-to-one, and many-to-many relationships.

8. Records can be placed into the data-







## **T**HE OUTPUT OF *the query system can serve as input for spreadsheet and graphing programs.*

base in various types of order: last in/first out, first in/first out, next, prior, key field, and "put it where you can." The order that is used will determine how quickly certain records can be accessed and how fast updates can be made.

9. A reference that connects a record with a data set can be created either manually or automatically.

10. Hashing codes can be used when entering records into the database. This method provides faster access than normal file structures.

You can't sit down and immediately begin using the Data Description Language to create a database. First you'll need to study the language and learn by trial and error practicing. But your programming effort will eventually create a very detailed and powerful database structure that can answer many more of your queries, if you know how to ask them correctly. Doing that part of the job with *MDBS III* will involve its Data Manipulation Language and Query Retrieval System.

*MDBS III* provides two ways to get information out of the database. The most traditional method is by writing a program in its Data Manipulation Language. This language module interacts with you to find out what you want to know. The other way is to use the Query Retrieval System;

this is a less formal method that will feel less like computer programming.

### **Data Manipulation Language**

The Data Manipulation Language is not a complete language in itself. Instead, it is added to an existing language to give it specialized capabilities. On the IBM PC, the *MDBS III* Data Manipulation Language commands can be added to BASIC. A programmer could then write a program in BASIC that sets up the screen, and asks the user questions. The program uses the answers to those questions as instructions for extracting information from the database. A similar program can be created for entering data into the database.

The Data Manipulation Language has 13 kinds of commands. They range from elementary functions that locate and retrieve data from records, to Boolean logic arguments that make very complex comparisons and extractions of data. The host language formats output to display or print reports for review. All of the numeric and manipulative power of the host language can be used on the information extracted from the database. This means you can use *MDBS III* for accounting and statistical applications that would be difficult or impossible with most other microcomputer-based programs that bear the name "database management sys-

tem."

The commands of the Data Manipulation Language can be used by programs written in Pascal, PL/1, COBOL, C, and assembly language, as well as BASIC.

It has been correctly stated that ease of learning to use a software package is inversely proportional to the number of things it can do. The *MDBS III* Data Manipulation Language provides a great deal of power and flexibility, but it is detailed and demanding to use. It is meant for experienced programmers.

Applications programmers who could use this language effectively don't work cheaply. Less skilled users will save time and money if they have some way to make informal, *ad hoc* inquiries into the database without requiring the services of a highly paid and busy programmer. The trend in the mainframe database industry is to provide this kind of capability through the use of a query language. A query language is a set of reasonably easy to use commands that can pull information from a database without the use of a formal program.

### **Query Retrieval System**

The query language associated with the *MDBS III* package is called the Query Retrieval System. This kind of system usually displays the requested data on the screen in a raw form, leaving it to the user to separate telephone numbers from social security numbers. The Query Retrieval System in *MDBS III* does, however, allow the data to be formatted into a customized report including labels for the data items. The query system can report information derived from stored data by using mean, variance and other mathematical functions. The output of the query system can serve as input for spreadsheet and graphing programs such as 1-2-3, including ISE's own spreadsheet program, *Knowledge Man*.

The Query Retrieval System is the most friendly face of the *MDBS III* package. With this system, a relatively unsophisticated user could write a useful query after a few minutes of training. Twelve commands are provided in the query language, but the user (or an assisting programmer) can pre-store common inquiries that can be performed by calling simple single names. Small pocket guides and crib sheets posted over the terminal can be used as convenient reminders of the query





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language commands.

The commands and syntax of the query language are simple. For example, a query to list the names and phone numbers of all females under 35 years of age in department 43 would be written as LIST NAME, PHONE FOR SEX = "F", DEPT = 43 AND AGE <35 THRU DEPTS, EMPLOYEES. The query language provides a simple key that unlocks the power of a large database system.

### Documentation

A user who considers acquiring a package this complex should be concerned about documentation. For better or worse, the documentation for *MDBS III* seems to come from the mainframe world. Though very complete, it is written on a graduate school level, and you are presumed to have a clerk with the time to separate the sections, enter them into the binder, make

they explained the design and implementation of *MDBS III* in great depth. The documentation set includes two excellent tutorial books, *A Primer on DataBase Management Systems*, and *A Guide to DataBase Management*. These, along with the documentation, could serve to turn a talented but inexperienced programmer into a *MDBS* programmer in just a few days. I would, however, have gladly traded some of the background explanations for more samples and examples. Illustrated examples are a particularly good way to explain programming hints and to demonstrate efficient programming strategies.

If you don't think you will learn enough from the manuals, ISE also offers customer support services and seminars. A telephone hotline service and program updates come with the software at no extra charge. The manufacturer's 3-day seminar on the use of *MDBS III* costs \$500; it may be a wise investment.

### Same Real Applications

So far, I have described a powerful database management package that requires the services of a good programmer to develop the database, can eventually be helpful to nontechnical users, includes many powerful features, and carries a healthy price tag. But you might still be wondering, what can you do with it? Here are some examples of actual applications.

● One organization runs over 60 commercial seminars, classes, conferences, and training programs each year. More than 80 people attend each event. The company needed a system able to handle both customer names and accounting information. Most microcomputer database management systems could handle the organization's lists of names and classes, but the more complex payment and corporate accounting functions would be too much to include in the average system.

*MDBS III* was used with a 7.5 megabyte hard disk system. The software was used with PL/1, the host language, to create a database with 126 fields aggregated into 17 record types, with 24 named relationships among the record types. The organization's software eventually consisted of 90 program modules for loading data and making reports from the database. The company now markets its software package to others in the education business at a

price between \$5,000 and \$6,000, depending on the options. An investment like this can be paid back in a few months if the system eliminates the need for even one clerical worker.

● Another example comes from a small company that developed an infor-

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***M****DBS III IS  
the most complete and  
flexible database  
management system  
available for  
microcomputers.*

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mation system to be used by administrators of schools with average enrollments of 1,000 students. The company estimates it spent 32 man-months developing the program package. Its software consists of 40 programs written in a version of BASIC, enriched by *MDBS III*. The database has 15 record types, 200 fields, and 25 named relationships. The software must be used with a 5- to 10-megabyte hard disk. The company's software packages sell for between \$3,500 and \$4,500.

● A similar development firm used *MDBS* to develop a medical billing package. This system took 6 man-months to develop. It includes nine record types, 130 fields, and nine named relationships (two are one-to-one, seven are one-to-many). The package can serve the office of a doctor with 500 to 750 patients when it is run on a system with a 5-megabyte hard disk. The software and support services are sold for about \$4,000.

### Software for Professionals

*MDBS III* is professional development software. Writing an integrated application worthy of the price and power of the package can take months of work. But it is by far the most complete and flexible database management system available for microcomputers. Relative to the many tens of thousands of dollars that would be charged for similar software for a mainframe computer, the mere thousands charged for *MDBS III* make it a relative micro-bargain.

/PC



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***T****HE QUERY  
Retrieval System is the  
most friendly face in the  
MDBS II package.*

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the page changes, and post the records.

It took me four dreary hours to assemble the documentation. Once I assembled a complete set of manuals, I found that



# IBM was just a personal computer until MultiMate came along.

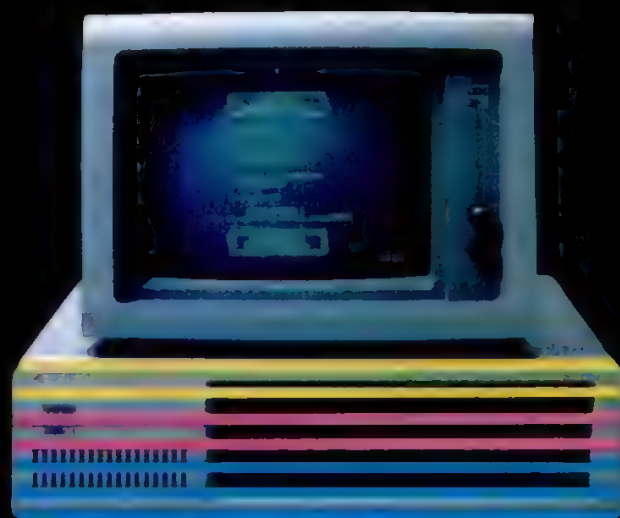
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Harry Browne, for those of you who have been too busy playing with your computers to keep up with the world of financial gurus, is the author of a number of books that purport to tell you how to hold on to your money as the financial world around you crumbles. Browne burst onto the scene in 1970 with his book *How You Can Profit from the Coming Devaluation*. He followed this with such entries as *How I Found Freedom in an Unfree World*, *You Can Profit from a Monetary Crisis*, *Complete Guide to Swiss Banks*, *New Profits from the Monetary Crisis*, and *Inflation-Proofing Your Investments*. He also writes an investment newsletter known as *Harry Browne's Special Reports*.

Browne really ought to do something about those schlocky titles. When I first

saw them, I expected to be provided with insights on the *National Enquirer* level ("Mad scientist discovers new formula for wealth after consultations with Jackie O.") Also, I am inherently suspicious of those who derive profit from warning others of pending gloom and doom. (My own new book, *How You Can Have Fun in the Com-*

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**A**N IDEALLY-designed permanent portfolio is one that provides safety and a measure of growth no matter what course the overall economy takes.

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ing Nuclear War, is a notable exception.)

Once I started reading the materials, however, I was surprised to learn that Browne's advice actually does make good sense. Behind the sensational titles, he

really advocates nothing more than simple commonsense money management, with a few of his own eccentricities thrown in.

Specifically, Browne recommends that you set aside a proportion of your wealth in a "permanent portfolio" of investments that should be allowed to mature over 10 years. This permanent portfolio, once established, should be left to grow on its own, with a minimum of interim tampering, while day-to-day monetary tradings are carried on within a separate "variable portfolio." An ideally-designed permanent portfolio is one that provides safety and a measure of growth no matter what course the overall economy takes.

In his voluminous writings, Browne makes recommendations for setting up such a permanent portfolio. He has published a series of tables that correlate investment dollars measured by percentages of money available for investment to appropriate investments, depending on inflation expectations. The investor is given recommendations for setting up a portfolio based on the investor's perception of the inflationary trend, and on whether the investor wants a balanced portfolio or one



## CURRENT PORTFOLIO BALANCE SHEET AND EVALUATION

JOHN DOE PORTFOLIO

JULY 4, 1982

PORTFOLIO HOLDINGS (ITEMS)	NUMBER OF UNITS (1)	CURRENT PRICE PER UNIT (2)	CURRENT MARKET VALUE (3)	CATEG. SHARE (4)	PURCHASE PRICE PER UNIT (5)	TOTAL PURCHASE PRICE (6)	UNREALIZED GAIN/LOSS (7) (-)	CHANGE (8)	OVER 30% DOWN
1-GOLD BULLION (OZ):									
BULLION ('78)	32.15	305.00	9,806	1.84	187.50	6,028	3,778	62.67	8
BULLION ('79)	96.45	295.00	28,417	5.51	238.00	22,955	6,462	28.15	
KRUGERERANDS	50.00	305.00	15,250	2.86	369.50	18,475	-3,225	-17.46	
TOTAL GOLD BULLION			54,473	10.21		47,458	7,015	14.78	
3-SILVER BULLION (OZ):									
BULLION	803.75	5.15	4,139	0.78	10.40	8,359	-4,220	-50.48	8
4-SILVER COINS (DMS):									
U.S. 902	1.00	5,810.00	5,810	1.09	10,850.00	10,850	-5,040	-46.45	8
5-SWISS FRANCS (FR):									
CURRENT ACCOUNT	1,000.00	0.48	475	0.09	0.59	585	-110	-18.80	
6-SWISS FRANCS W/INT. (FR):									
75 BONDS OF '83 (10)	10,000.00	0.48	4,800	0.90	0.59	5,900	-1,100	-18.64	
52 BONDS OF '86 (10)	10,000.00	0.48	4,800	0.90	0.54	5,400	-600	-11.11	
TOTAL SWISS FRANCS W/INT.			9,600	1.80		11,300	-1,700	-15.04	
7-STOCKS (SH):									
APPLE COMPUTER	2,000.00	22.00	44,000	0.25	18.00	36,000	8,000	22.22	
GENERAL ELECTRIC	1,000.00	63.50	63,500	11.90	53.25	53,250	10,250	14.93	
UNITED TECHNOLOGIES	800.00	27.75	22,200	4.16	14.50	20,800	1,400	22.92	
FEDERAL EXPRESS	800.00	45.50	36,400	5.12	49.75	39,800	-3,400	-8.54	
TOTAL STOCKS			157,000	29.43		149,900	7,100	4.74	
8-LEVERAGED STOCKS (SH):									
BEICO WTS	1,000.00	7.25	7,250	1.36	8.50	8,500	-1,250	-17.11	8
ATL-S CORP WTS	1,300.00	5.00	6,500	1.41	4.50	5,850	650	11.11	
RESORTS INT'L WTS	500.00	2.25	1,125	0.21	4.00	2,000	-875	-43.75	8
GREYHOUND CORP WTS	2,000.00	0.75	1,500	0.28	1.50	3,000	-1,500	-50.00	8
TOTAL LEVERAGED STOCKS			17,375	3.26		17,350	25	0.72	
10-REAL ESTATE:									
HOME	1.00	179,000.00	179,000	33.55	87,500.00	87,500	91,500	104.57	8
APARTMENT BLDG	1.00	255,000.00	255,000	47.80	239,000.00	239,000	16,000	6.69	
TOTAL REAL ESTATE			434,000	81.35		326,500	107,500	32.92	8
12-CASH (10):									
CASH	5,000.00	1.00	5,000	0.94	1.00	5,000	0	0.00	
13-TREASURY BILLS:									
CAPITAL PRES FUND	36,719.00	1.00	36,719	6.80	1.00	36,719	0	0.00	
15-TREASURY BONDS:									
7 7/8% OF '02-07	10.00	610.00	6,100	1.14	810.00	8,100	-2,000	-24.69	
10 3/8% OF '04-09	10.00	730.00	7,300	1.37	860.00	8,600	-1,300	-15.12	
TOTAL TREASURY BONDS			13,400	2.51		16,700	-3,300	-19.76	
16-OTHER L.T. & HOLDINGS:									
ATT 8 5/8% OF '07	6.00	600.00	3,600	0.67	875.00	5,250	-1,650	-31.43	8
TWA 12 OF '05	6.00	1,030.00	6,180	1.16	990.00	5,940	240	4.04	
IBM 9 1/2% OF '86	12.00	875.00	10,500	1.92	950.00	11,400	-1,140	-10.00	
TOTAL OTHER L.T. & HOLDINGS			20,400	3.76		22,590	-2,590	-11.29	
18-LONG-TERM & DEBTS:									
HOME MORTGAGE	1.00	-69,800.00	-69,800	-13.00	-39,350.00	-39,350	-30,450	77.38	8
APT BLDG MORTGAGE	1.00	-154,750.00	-154,750	-29.01	-179,900.00	-179,900	25,150	-13.98	
TOTAL LONG-TERM & DEBTS			-224,550	-42.09		-219,250	-5,300	2.42	
GRAND TOTALS			833,481	100.00		843,961	99,520	22.93	

Figure 1: A printout of the balance sheet and evaluation using the sample portfolio provided with the program disk.

in which he "goes for broke" (betting the ranch that the inflationary scenario he predicts will in fact take place). In the balanced approach, which Browne mandates for anyone investing substantial funds, the investor's assets will be protected no matter what course inflation takes (although he will of course do better if he guesses right on the direction of inflation). In the go-for-broke approach, the investor will do extremely well if he guesses right on the inflationary direction but could be wiped out if he guesses wrong.

### Enter The PC

What has all this got to do with my IBM Personal Computer? Just this: Figuring out how to construct your portfolio, and then predicting its future performance, requires frequent reference to the tables Browne provides for his readers and subscribers. Alterations in assumptions, or changes in the portfolio, demand time-consuming recomputations. The ideal tool for making mundane and repetitive computations quickly and accurately is the computer!

C. R. Hunter & Associates came to the same conclusion, and now offers The Permanent Portfolio Analyzer, which allows Harry Browne's devotees to construct their permanent portfolios based on examination of different outcomes and assumptions. With this program, you can examine more options in an evening than you could otherwise review in a month using blunted pencils and overworked calculators. Consequently, you can base your

**A**PPENDED TO  
the manual are some  
excerpts from the  
writings of Harry  
Browne that explain his  
permanent portfolio  
philosophy.

investment decisions on a greater wealth of simulated experience.

This program is, in effect, a dedicated spreadsheet. It inputs your information about expendable funds and existing



investments and makes recommendations as to how to construct a portfolio, prints a balance sheet of your existing portfolio, prints a 10-year projection of your portfolio vs. the recommended portfolio, and advises you of what changes must be made (purchases or sales) to bring your portfolio into line with the recommended portfolio. Because of the program's ability to instantly recalculate figures, it is ideal

**T**HERE ARE ten options on the main menu of the program and each of these in turn is explained by the operations manual.

for doing "what if" analysis.

For what it does, The Permanent Portfolio Analyzer is good. If you are a devotee of Harry Browne and have an IBM Personal Computer, you should really love this program. Even if you are not a Harry Browne fanatic, the program permits you to alter Browne's assumptions about anticipated performance of different categories of investments. If nothing else, it will get you to think about how your money is being invested, a sound goal for anyone living above subsistence level.

### Inside The Program

The Permanent Portfolio Analyzer comes with a well-written operations manual that thoroughly explains how to enter data. Appended to the manual are some excerpts from the writings of Harry Browne that explain his permanent portfolio philosophy and the assumptions upon which his tables (which are already built into the program) are based. Actually, these excerpts are as much of Browne's writing as you will ever need to read in order to fully understand the program's underlying theory and to use it as a tool for defining your investment strategy.

Commendably, the documentation is written specifically for the IBM Personal Computer, although an earlier version was tailored to the Apple Computer. Consequently, The Permanent Portfolio Ana-

<<< THE PERMANENT PORTFOLIO ANALYZER >>>

PAGE 1

PORTFOLIO TEN-YEAR PROJECTION ANALYSIS

NAME THE PORTFOLIO: JULY 1, 1982

EXPECTATION: RISING INFLATION

PORTFOLIO HOLDINGS (ITEMS)	NUMBER OF UNITS (1)	CURRENT PRICE PER UNIT (2)	CURRENT MARKET VALUE (3)	CATED. SHARE (4)	TARGET SHARE (5)	TARGET VALUE (6)	DIFFERENCE TO BE BOUGHT/OLD (7) (8)	FUTURE P.P. CURRENT HOLDINGS (9)	FUTURE P.P. TARGET HOLDINGS (10)
<b>1-GOLD DOLLAR (100):</b>									
DOLLAR ('70)	32.35	305.00	9,866	1.00					
DOLLAR ('77)	36.45	305.00	11,117	1.00					
HAUSDORFF	30.00	305.00	9,150	2.00					
<b>TOTAL GOLD DOLLAR</b>			<b>28,133</b>	<b>3.00</b>	<b>35.00</b>	<b>114,719</b>	<b>114,719</b>	<b>114,719</b>	<b>309,879</b>
<b>2-SILVER DOLLAR (100):</b>									
DOLLAR	803.75	5.10	4,110	0.70	15.00	80,562	76,452	6,210	120,130
<b>4-SILVER COIN (100):</b>									
U.S. 100	1.00	5,610.00	5,610	1.00	2.00	10,670	4,060	7,003	13,007
<b>5-DIVID FRANCH (100):</b>									
CURRENT ACCOUNT	1,000.00	0.00	0	0.00			-475	306	
<b>6-DIVID FRANCH (100):</b>									
71 BOND OF '83 (100)	10,000.00	0.00	0	0.00					
91 BOND OF '86 (100)	10,000.00	0.00	0	0.00					
<b>TOTAL DIVID FRANCH (100)</b>			<b>0</b>	<b>0.00</b>	<b>0.00</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>7-STOCKS (100):</b>									
APPLE COMPUTER	2,000.00	22.00	44,000	0.25					
GENERAL ELECTRIC	1,000.00	42.50	42,500	11.90					
LOUISIANA LAND	800.00	27.75	22,200	4.16					
FEDERAL EXPRESS	400.00	45.30	18,120	8.12					
<b>TOTAL STOCKS</b>			<b>126,820</b>	<b>24.13</b>					
<b>8-LEVERAGED STOCKS (100):</b>									
GETCO LTD	1,000.00	7.25	7,250	1.36					
ATLAS CORP LTD	1,500.00	3.00	4,500	1.44					
HEWLETT INT'L LTD	500.00	2.75	1,375	0.71					
BRIDGEMAN CORP LTD	2,000.00	0.75	1,500	0.26					
<b>TOTAL LEVERAGED STOCKS</b>			<b>14,625</b>	<b>1.26</b>	<b>5.00</b>	<b>26,474</b>	<b>9,299</b>	<b>17,175</b>	<b>16,100</b>
<b>10-REAL ESTATE:</b>									
HOME	1.00	174,000.00	174,000	33.20					
APARTMENT BLDG	1.00	253,000.00	253,000	47.80					
<b>TOTAL REAL ESTATE</b>			<b>427,000</b>	<b>81.20</b>	<b>53.00</b>	<b>80,472</b>	<b>-133,970</b>	<b>64,501</b>	<b>65,499</b>
<b>12-CASH (100):</b>									
CASH	1,000.00	1.00	1,000	1.00	0.70	700	-300	1,100	600
<b>13-TREASURY BILLS:</b>									
CAPITAL PRES FUND	34,719.00	1.00	34,719	4.00	14.00	48,607	13,888	38,729	74,313
<b>15-TREASURY BONDS:</b>									
7 7/8% OF '82-87	10.00	610.00	6,100	1.14					
10 3/8% OF '84-89	10.00	710.00	7,100	1.37					
<b>TOTAL TREASURY BONDS</b>			<b>13,200</b>	<b>2.51</b>	<b>14.00</b>	<b>48,607</b>	<b>41,507</b>	<b>8,100</b>	<b>46,313</b>
<b>16-OTHER L.T.O. HOLDINGS:</b>									
INT'L BOND OF '87	1.00	400.00	400	1.07					
TEN 12 OF '85	1.00	1,030.00	1,030	1.14					
TEN 12 OF '86	12.00	820.00	9,840	1.92					
<b>TOTAL OTHER L.T.O. HOLDINGS</b>			<b>11,270</b>	<b>2.76</b>				<b>10,869</b>	<b>15,484</b>
<b>18-LONG-TERM BOND:</b>									
HOME MORTGAGE	1.00	-47,000.00	-47,000	-12.00					
INT'L BOND MORTGAGE	1.00	-154,750.00	-154,750	-21.41					
<b>TOTAL LONG-TERM BOND</b>			<b>-201,750</b>	<b>-33.41</b>	<b>-36.00</b>	<b>-56,016</b>	<b>140,434</b>	<b>-132,426</b>	<b>-71,992</b>
<b>GRAND TOTALS</b>			<b>633,481</b>	<b>100.00</b>	<b>100.00</b>	<b>633,481</b>		<b>100,000</b>	<b>633,481</b>

Figure 2: A printout of a 10-year portfolio projection analysis from the program disk sample.



lyzer avoids the shortcomings of so many programs on the market that provide nothing more than a cover sheet to summarize the IBM features and confusing references to incompatible machine requirements in the remainder of the documentation. Pictures are provided of specific IBM PC keys required by the program.

There are ten options on the main menu of the program and each of these in turn is explained by the operations manual. The first option is to enter your current portfolio. There are 19 different types of investments, including "other." Prompts for existing investments in each category are given in sequence. After entering each item, you are permitted to edit any errors; after the item is correct you can enter it and proceed to the next entry. After you enter your investments, you are prompted to give the portfolio a name for storage on disk. The name is limited to eight characters to conform to DOS file-naming conventions. (Portfolio entries are stored on disk with a .P extension.)

Option 2 provides recommendations as to what amounts to commit for various

types of investments. These recommendations are based on the amount of money available to invest, on which inflation sce-

## **O**PTION 4 *shows what changes are necessary to bring the actual portfolio into compliance with the recommended portfolio.*

nario you perceive as most likely (from a choice of five with an additional "uncertain" category), and on whether you desire a balanced (hedged) portfolio or prefer to go for broke, betting all your marbles that you are guessing right on the direction inflation will take. After you have entered the amount of money to invest, the anticipated inflation scenario, and desired risk level, the program responds with its rec-

ommended investments by category, indicating both the percentage of the total investment and the dollar amount to be invested in each category.

Option 3 prints out a balance sheet for your current portfolio that breaks down the performance to date of the items in the portfolio. This is used to periodically check and update the progress of your investments. Before the advent of the computer age, such updates were time-consuming; consequently, investors rarely received an update more than once a year. With the computer, this aid can be used more frequently to track the value of your portfolio. Figure 1 shows the output of the balance-sheet evaluation, using the sample portfolio provided with the program disk. The balance sheet computes the total worth of the entire portfolio, as well as the worth of each of the component investments. It then contrasts the percentage of the total represented by each component investment against each component category. It shows how well (or poorly) each investment has done and highlights (with an asterisk in the extreme right-hand col-

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umn) those that have appreciated or depreciated more than 30 percent since the original purchase.

Option 4 prints out a projection of how your portfolio will do over a 10-year period, compared with the anticipated performance of a recommended portfolio. Additionally, Option 4 shows what changes are necessary to bring the actual portfolio into compliance with the recommended portfolio. It computes the estimated future purchasing power of both the existing and recommended portfolios expressed in today's dollars. Again this is made possible by the speed of the computer, as it would be inordinately time-consuming to do all of the discounting necessary to produce current dollar figures using a manual approach, particularly if you wanted to alter the yearly inflation figures. Figure 2 provides a sample of the output of Option 4, again using the sample portfolio set forth on the program disk.

Option 5 allows you to change entries in your portfolio, add new entries (for new purchases), or delete existing entries (when investments are liquidated). This

editing option permits you to make changes in the existing portfolio without having to re-enter the entire portfolio. (As with any program requiring data retention, it is a good idea to make backup copies and to change and test the backup before tampering with the original; to its credit, the manual stresses this point.)

Option 6 permits you to change Harry

power because it makes the program a useful tool even if you totally disagree with Harry Browne's assumptions.

Options 7 through 10 perform house-keeping operations to enhance ease of use. Option 7 permits you to delete a stored portfolio, thus clearing disk space for data entry. Option 8 causes a temporary exit to DOS and permits a check of the disk, showing how much space is left on the disk for new data entry. With Option 9, you may customize *The Permanent Portfolio Analyzer* to your printer by telling the program whether or not to use condensed print, how many lines per page, and even to send ASCII escape sequences to the printer. Option 10 provides an exit from the program to BASIC but not before prompting with a friendly reminder about disk backup.

#### Bottom Line Bugs

While the program performs well for those interested in its basic purpose, there are a few shortcomings and program bugs. The worst outright bug on the copy of the program provided for review was that on

## OPTION 6

*makes the program a useful tool even if you totally disagree with Harry Browne's assumptions.*

Browne's assumptions about inflation rates and the future performance of various categories of assets. This option lends *The Permanent Portfolio Analyzer* its

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the balance sheet and projection printouts, it persisted in printing the first category (gold bullion) above the title entries for the page. I assume that this bug will be speedily corrected.

## **W**HILE THE program performs well for those interested in its basic purpose, there are a few shortcomings and program bugs.

More fundamental and difficult to correct are some of the limitations built into the data entry functions of the program. All items are entered according to type of item, number of units, purchase price per unit, and current price per unit. While this is fine for some categories, it is a little syntactically awkward for others. For example, the program confines you to the category "purchase price" when the category is "cash," and "number of units" when the item is a house. A bit more customization of the prompts in individual categories would be helpful.

Also, true to its secret identity as a spreadsheet, the program simply performs numerical computations without regard to how silly the numbers might be in the real world. For instance, if you are using Option 2 of the program to receive recommendations for creating an ideal portfolio and you tell the program that you have \$500 to invest, the program does not modify its recommendations (or perhaps even tell you that you can't get much diversity from a \$500 investment), but dutifully applies its multipliers and advises you to put 20 percent into real estate, which it handily computes to be \$100. Those of us with nondigital mentalities intuitively recognize that the number of \$100 real estate investments in today's world is painfully limited.

The biggest shortcoming of a program such as this, however, is one which has nothing to do with the way in which the program itself is written, but relates instead to the perceptions of the user. Because of the ability of the computer to

spew out mountains of numerically-accurate computations, it becomes all too easy for the user to lose sight of the guesswork and speculation that form the foundation for the numbers.

For those looking for a computerized crystal ball, neither this program nor any other will suffice. Simply because the program prints out a figure purporting to represent future purchasing power of a given investment, computed down to the penny, does not mean that this projection will materialize. Economics is at best an imprecise science; economic forecasting over the long haul is roughly on a par with

long-term weather forecasting. Asking the ten leading economists for their predictions will certainly produce at least ten different responses.

Bearing this in mind, the user who thinks that this or any other program can guarantee future prosperity is bound to be disappointed. On the other hand, commonsense money management can and does pay off. To the extent that the user recognizes a need for intelligent planning and requires a tool to provide a framework for such planning, The Permanent Portfolio Analyzer can justify its cost many times over.

/PC

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*The first attempt to combine data processing, word processing, communications, and graphics in one program sacrifices efficiency for integration*

# Context MBA: Half A Step In The Right Direction

---

## Context MBA

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CIRCLE 700 ON READER SERVICE CARD

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Many of you probably use a number of programs on your IBM Personal Computers. A typical list of the most commonly-used programs would include a word processor, a spreadsheet program, a database manager, and a communications package. If you own the IBM graphics adapter, the list might also include a program for creating graphics. The problem with this approach to applications is that the programs don't necessarily relate to one another. Moving information from one

program to another can be difficult.

With the advent of the PC, and other

---

**C**ONTEXT STILL  
*runs too slowly for a  
person accustomed to  
the speed of a  
microcomputer.*

---

microcomputers with large memory capacity, a new breed of programs, known as "integrated management" systems began to appear. These combine the most common applications into one program. The first of this new breed was Context MBA from Context Management Systems of Torrance, California.

A simple example illustrates the concept of integrated software. Suppose you

need to produce a report containing next year's divisional sales forecasts. The first step is to retrieve the division's historical sales information from the corporate database. Next, you insert this information into the spreadsheet to obtain next year's forecast. If possible, you convert the results into a plot showing the divisional growth curve. Perhaps you compare a few scenarios on the same plot. Using the word processor, you would generate the report, and insert the plots and pertinent figures. Finally, you would hook the computer to a modem and send the report to the managers via electronic mail.

With the usual unrelated software programs, this procedure would probably be long and tedious. By using Context MBA, however, you could do the job in well under an hour. It therefore must be acknowledged that Context MBA is not perfect; in fact, the program can be clumsy and troublesome. Despite the PC's 8088 processor, Context still runs too slowly for a person accustomed to the speed of a microcomputer. Nevertheless, its ability



to transform a spreadsheet into a graph and a report, and create a new graph and a new report within minutes based on different assumptions is exciting.

### Hardware Requirements

Context MBA requires at least 256K

---

## **C**ONTEXT *features modules for a database, spreadsheet, word processor, and communications.*

---

RAM and at least two disk drives. With additional memory, execution speed or workspace size can be increased. To produce graphics, an IBM color graphics adapter and a monitor are also required. A printer is required for printed output. Context MBA Version 2.0 supports only the Hayes modems or dumb acoustic modems for data communications.

The program is written in UCSD Pascal and is heavily copy-protected. This implies that it cannot be used with either a RAM disk or a hard disk at this time. Furthermore, files created by Context cannot be used by any MS-DOS programs.

Context can support a worksheet containing up to 999 rows and 95 columns. Database operations can also support 6,000 rows.

### Software Overview

Context features modules for a database, spreadsheet, word processor, and communications. In Context Version 1.4, these are referred to separately as "contexts." They function little better than four programs with easy data exchange between them. In Version 2.0, however, the modules act as additional spreadsheet commands, a significant improvement.

When a number of applications are cemented into a single program, quality is sometimes sacrificed. In the case of Context MBA, none of the modules, except the spreadsheet, is as versatile as a corresponding high quality MS-DOS program. The memory requirement is also greater than for four separate programs.

### Creating Documents

Before you can begin to create a document, Context must format a blank data disk. This disk can be given a "Volume" name and a "Folder" subheading. Each worksheet, called a "Document," can also be given a name. By providing more categories, this allows greater flexibility than 11-character file names. In addition, documents in different folders can have the same names without conflict.

### The Spreadsheet

The spreadsheet is undoubtedly the most useful module in Context MBA. It performs all standard spreadsheet functions, such as placing formulas, numbers, and labels in cells and then formatting them. Cells may also contain text (each cell has an 8,000 character limit) and graphs. You can replicate, delete, and move this information in the same way as in a standard spreadsheet.

The array of cell formatting commands is impressive. Cells may be in dollar or percent format and can be right, left, or center justified. Cells can be displayed in fixed, scientific, or engineering format, and display precision may be fixed, with rounding or truncation. In addition, a row can actually be displayed as a number of rows on the screen, since cells may contain lines of text or graphs. Similarly, a column can have any width, and may even take up the entire screen.

### Context Vs. VisiCalc

The spreadsheet bears a more than superficial resemblance to VisiCalc. Context, however, improves on VisiCalc in a number of ways, notably, by providing better help messages, variable column and row sizes, and graphics capabilities.

Although Context retains VisiCalc's command structure, its additional capabilities make the command strings confusing. For example, suppose you wish to replicate five columns from row A to row B, copying the contents of each cell into a new row. With VisiCalc, this command is /R(A1...A5)<cr>Y. With Context, it becomes /R(A1...A5<cr>CB1<cr>1<cr>Y (where <cr> means "Press the Enter key"). Admittedly, Context is more versatile; this same command can also be used to replace a table and to make a number of copies of the table. It's questionable, however, whether the gain in versatility compensates for difficulty in remembering the

command syntax and the increased, time-consuming disk activity.

### Split Screens

Like VisiCalc, Context MBA features a window capability. The screen can be split either horizontally or vertically to display up to four separate windows simultaneously. This is particularly useful when a text cell is expanded to fill the entire window. By synchronizing the windows, you can display part of a database, along with a half-page textual description of the top row of data. In the same way, a spreadsheet can be displayed alongside a graphic rendition of its data.

### Graphs

Context allows you to choose from an extensive array of graphs, including bar, line, pie, scatter, high-low-close, area, stacked bar, and side-by-side bar graphs. By microcomputer terms, these graphs take a fair amount of time to generate—about 1 minute, but the results are pleasing and probably well worth the effort.

To create graphic displays, as well as to print, you must have an IBM graphics adapter. A color monitor is not necessary, however, and the printed result contains different shading patterns.

A graph is specified in the same way as a printer or a communications line. For example, a cell containing the formula @PLOT(BARS)+@DATA(R,B2...E6)+@TTL(R,'My plot') would specify a stacked

---

## **I**N VERSION 2.0, *the modules act as additional spreadsheet commands.*

---

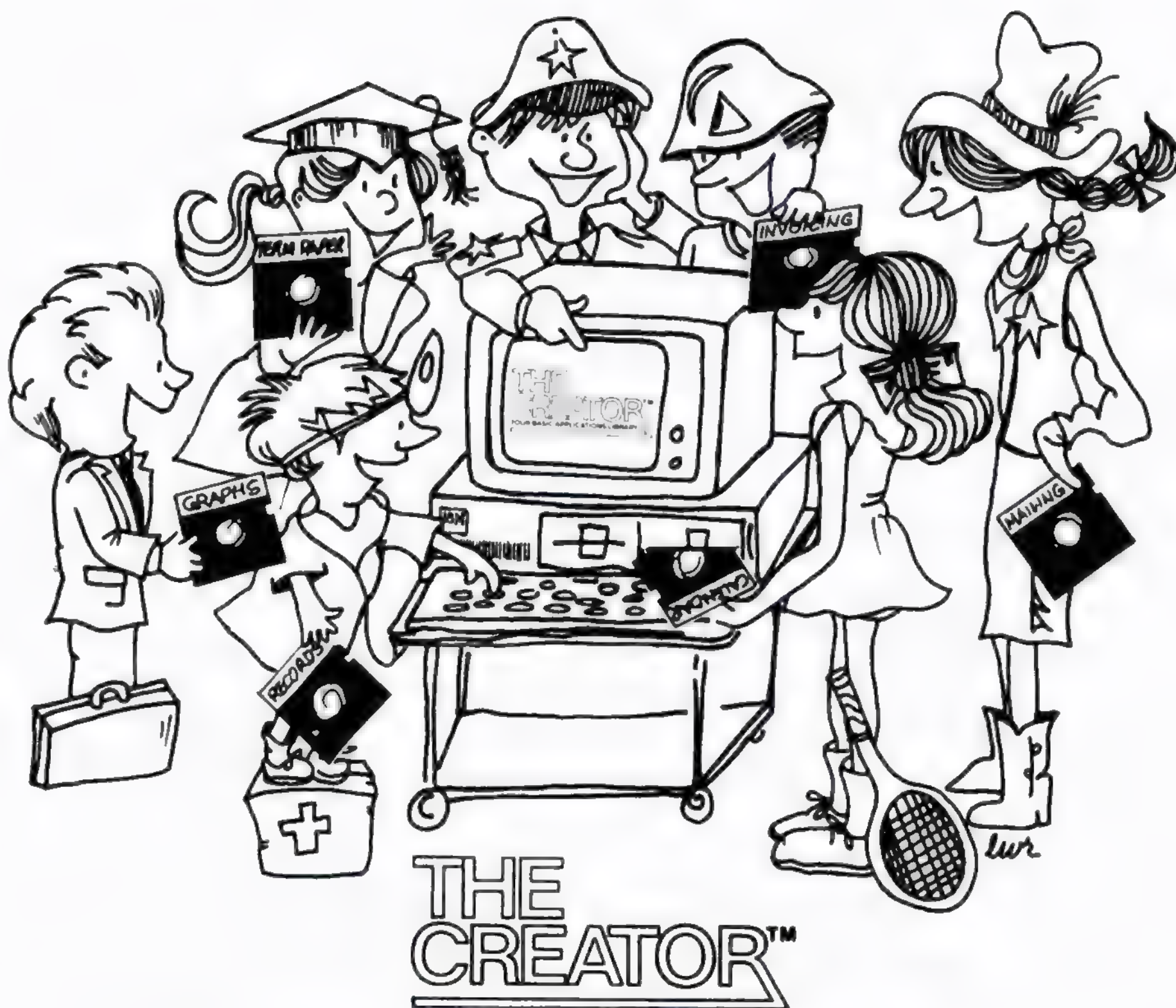
bar graph with the data selected by rows for rows B through E, each row containing columns 2 through 6. A title would be included to the right side of "My Plot."

A plot is displayed only when the cell is expanded to fill a window; otherwise, the cell displays "GRF."

### Database Manager

A database, as defined by Context MBA, is a tabular worksheet with a row of





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titles along the top. A general worksheet cannot really be used as a database; instead, the contents of each cell are a label or a value. A subset of the current worksheet can be used as a database.

Once you gain access to a database via the command /SAA, you can specify search criteria by placing the desired values in cells. Here is an example:

First name	Last name	Address	Phone
Mark	Z...	...MD	

These entries will select people living in Maryland whose last names begin with a Z, and whose first names are Mark.

The selection process can actually insert the desired records into the current worksheet rows. In fact, database operations can be performed on a compatible standard worksheet. Unfortunately, in order to select records from a database on disk, the rows on the worksheet must be set up in the same format as those in the database. This can be confusing.

Context includes a number of database-like commands that can be used to

manipulate rows. Rows can be sorted in ascending or descending order. As with selection, the sort criteria are entered into the worksheet cells and then the sort is requested. Duplicates may be removed.

As in the example above, the selected

## ***D***ATABASE operations can be performed on a compatible standard worksheet.

values can be plotted, totaled, used in forecasts, placed into a text cell, sent over the communications line, replaced and/or appended to the database.

Database selection is very slow; a single search criterion on a database of 114 records takes 4:44 minutes to complete.

Surprisingly, the demo documentation talks about using this method to look up phone numbers (which I did) with a database of 6,000 records. At this speed, the operation would take about 4 hours! Even with 200 records, the whole operation would take 10 minutes, including load time—not very convenient.

### Communications

The communications facility of Context is a bit crude, although the program does include a number of useful commands that make automating the communication task simple.

Communications operations are performed in the same way as plotting functions, by filling a cell (or several cells) with the communications formulas. For example, the formula @DIAL('555-1212',T)+@RECEIVE('>')+&SEND(B1) will touchtone dial the number 555-1212, wait for a > sign, then send the contents of cell B1. There is also a provision for using acoustic modems or Hayes modems. If you do not specify the modem, Context

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First, Last  
Next Previous  
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Insert Key  
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Replace Key  
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# of Data Records  
# of Primary Keys  
Max Key Length

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requires a Dial command in order to enter communications mode.

Communications is a true mode. (A mode is a piece of a program in which certain commands may not perform the same functions as in other pieces of the pro-

### Text Editing

The earlier versions of Context had an amazingly incomprehensible and unusable text editor. Version 2.0 is somewhat better, but it is still very clumsy, compared to almost any MS-DOS editor.

Every function in the editor is performed in modes. To delete a character, you must enter delete mode, space over the offending characters, then exit from delete mode. Hitting a return deletes a full line, although this is not apparent until you complete the function.

To insert characters, you must enter insert mode (at which point all successive

lines disappear from the sheet), type in the new characters, then exit from insert mode. Finally, in order to save the text, you must remember to type ^C in all the right places. The formula editor works in the same way, making it extremely difficult to edit a formula.

### Search and Replace

The text editor also includes search and replace commands that operate on only one word at a time. A Marginate command fills and justifies paragraphs. Blocks are moved by using the savespace com-

**THE TEXT EDITOR**  
also includes search and  
replace commands that  
operate on only one  
word at a time.

gram.) This means that you must exit from the mode to perform functions other than simple communications functions. You can keep the characters that you've received, but any characters received while performing other operations are lost. After you exit from the mode, you can transmit a cell, return to communications mode, or switch to a new cell. Since each cell holds only a maximum of 8,000 characters, you must remember to move to a new cell occasionally if you want to keep the communications information.

I encountered a swarm of bugs in the communications mode. For instance, Context did not come up in half duplex, despite my request. Tabs are not displayed. Error messages are pitifully brief. Text is not always saved. In addition, 1200 baud does not work well; the screen does not scroll, but instead, works in a circular page mode. Obviously, the program will not run at speeds faster than 1200 baud without dropping characters.

In general, command options are confusing, and operation is not very smooth. If your primary purpose is to send and receive other MBA spreadsheets, however, the communications mode is adequate. You can send the first 8,000 characters, move to a new cell, and receive some more characters. For spreadsheets with fewer than 8,000 characters, the entire process can be automated, from dialing to hanging up the phone.

Once a cell is filled with a worksheet of information, the information can be expanded into a set of cells, then manipulated just like any other worksheet.

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mand, which can also be used to insert graphs or cells into the text.

Since Context runs under UCSD p-System, and because of its folder and document setup, it is not possible to use an MS-

**C**ONTEXT  
*requires a hefty 256K,  
every operation requires  
some disk activity, and  
the program is  
extremely slow.*

DOS editor first and then put the document into Context. Because the editor performs so poorly, this is a serious defect.

#### Taking Everything Together

It is impossible to list all of the options and commands within the Context MBA program in a review of this size. The best overall summary would be that the designers included nearly all of the desirable options for a spreadsheet. The graphics displays are also very usable and versatile, but the need for a graphics adapter is discouraging. The database manager is amazingly slow, easy to use, but not as versatile as the better database managers on the market. The communications mode is confusing and not nearly as good as most smart terminal programs. It does excell in automated transmission/reception of portions of the worksheet. The text editing is clumsy and confusing, better than nothing, but not nearly as effective as the better MS-DOS editors.

#### Major Defects

Context MBA fails in two major areas. The first is implementation. Despite protests to the contrary, UCSD p-System simply does not produce good code. Context requires a hefty 256K, every operation requires some disk activity, and the program is extremely slow. For example, just loading Context takes 2½ minutes. The amount of disk reading, writing, and searching involved in this program makes me wonder whether or not Context reduces the lifetime of drives, especially when it is compared with programs that

can run under a RAM disk (for no disk activity) or a hard disk. On the basis of speed alone, I think it would be difficult to convince anyone who has used a micro-computer before to seriously consider Context, unless the application requires a feature that only Context can provide.

The second area in which Context fails is design. The Lisa and the Xerox Star seem particularly appealing because they feature modeless software. Context, on the other hand, is chock full of modes. This makes it easy to forget which mode you are in, causing the program to do something unexpected. In addition, error mes-

sages are terribly short (sometimes just a beep), making matters even worse. (I must admit, however, that Version 2.0 is much better than 1.4 in this respect. Ironically, the difference is that Context MBA Version 2.0 no longer has contexts.)

The idea of an integrated management system is excellent. Context MBA does succeed in this area. It is very easy to transfer information from one program to another. Nevertheless, a good set of compatible text editing, database, graphics, and spreadsheet programs that runs under MS-DOS is probably a better investment.

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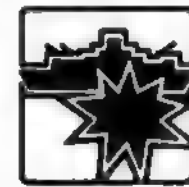
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4626			x
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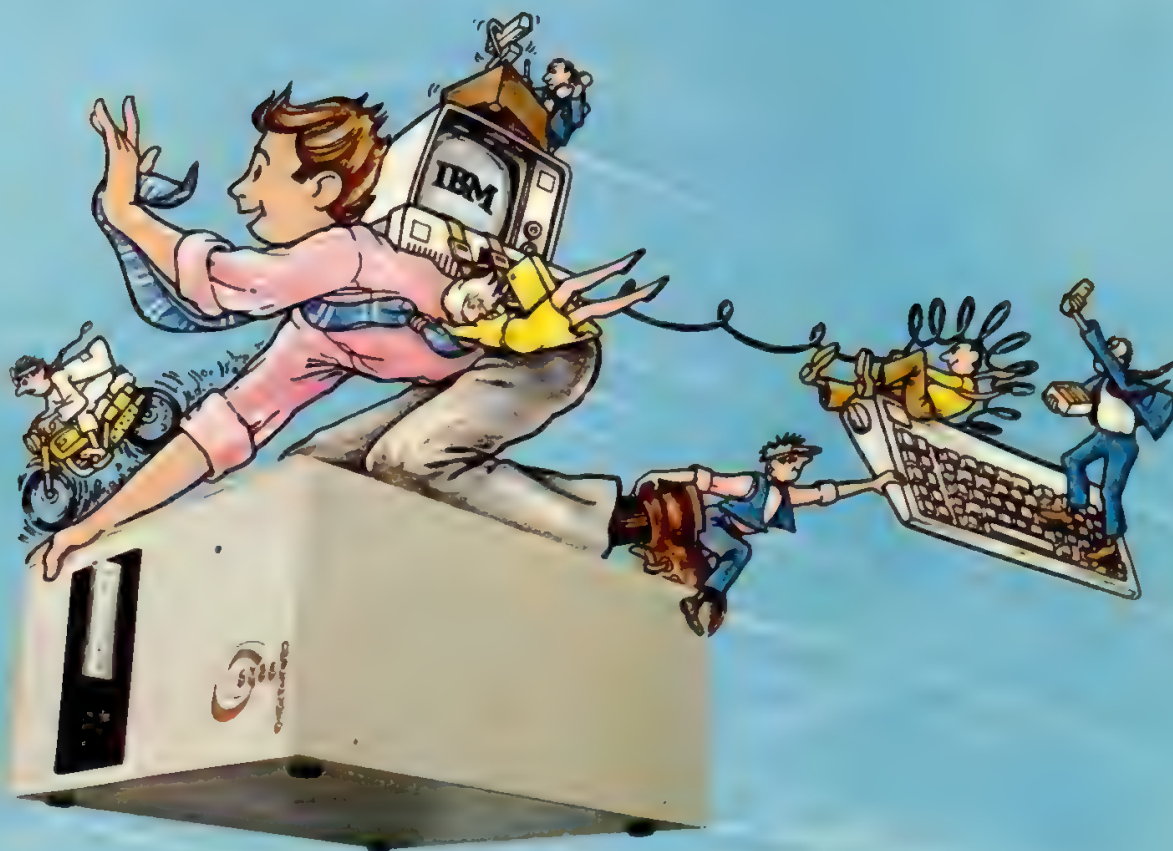
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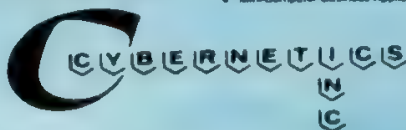
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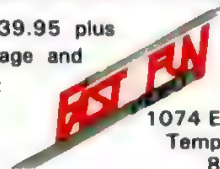
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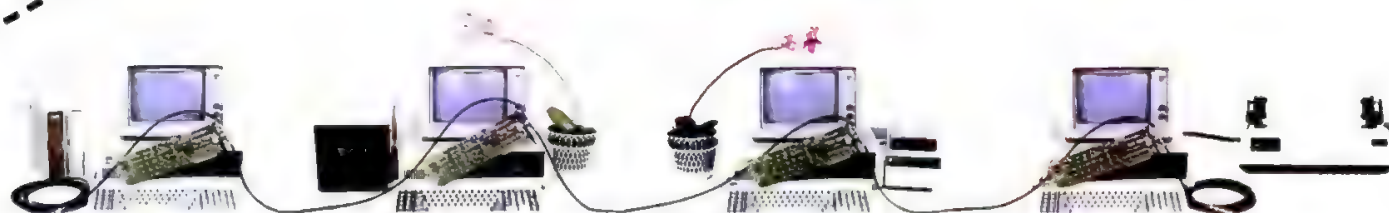
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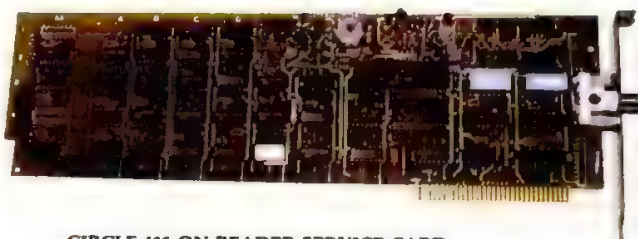
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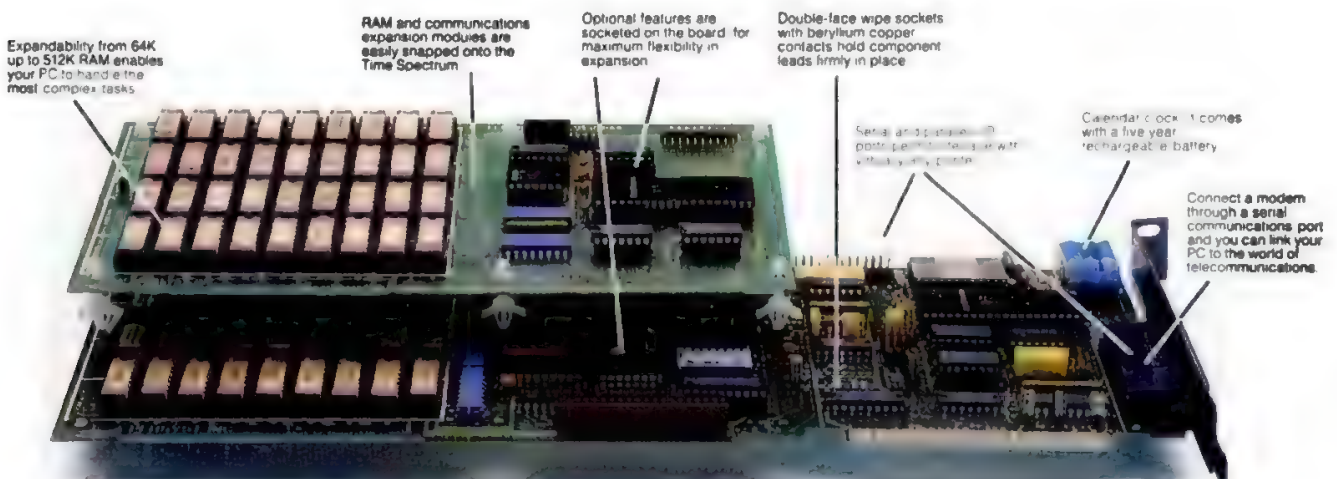
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*The percentage of women in computing is probably greater than you realized, but the industry is dominated by men—for reasons that have little to do with computers themselves.*

# WOMEN IN COMPUTING

**F**ifty years ago, Sigmund Freud posed the question to his diary, "What do women want? My God, what do they want?" I can tell him exactly what I want: a hi-res RGB monitor, more RAM, double-sided drives to replace the dinky little 160K jobs I bought when the PC first came out, a game board and joysticks, a surge suppressor, and a Compaq portable—for starters. But I'd be the first to admit to Dr. Freud (or to my microshrink, Eliza), most women do not share my lust for hardware. The overwhelming majority of my fellow fanatics out there in the global village are indeed fellows—often men whose wives or girlfriends think computers are the dullest things since white boxer shorts.

If you're a sociobiology-minded type, you might say that all of this is to be expected, that a fascination with C-compilers is just one of those things that naturally springs forth at puberty, along with male facial hair. (And if so, please turn the page—or better yet, check TV Guide to see if there's a John Wayne movie on tonight.) But if you're a husband who's starting to feel a little lonesome for a co-pilot for your *Flight Simulator* (or a wife who's sneaking a peek at this magazine because your social life is beginning to resemble one big

Superbowl Sunday), please read on.

## A Short Social History

Do you remember those little joke-tests that kids use to give to each other in the pre-liberated 60s to see if a person was "masculine" or "feminine"? (Sample: What do you think of when you hear the word "ring"? If you're a boy, you're supposed to think of the spot where the heavyweight championship is decided, and if you're a girl you're supposed to conjure up visions of 14-karats.) In my experience, that's more or less what happens when a man and a woman look at a personal computer. What we have here, despite all our state-of-the-art 1200-baud modems, is a failure of communication.

Before I'm accused of gross stereotyping, however, let me hasten to mention that times are changing. Interestingly, within the computer industry, the gender gap seems to be closing faster than anywhere else. According to the National Science Foundation's most recent statistics, women accounted for 26 percent of all computer specialists in 1980, a 44 percent increase since 1978. There are undoubtedly many more women in the field today—and the industry, on the whole, appears comparatively unentrenched and ready to





welcome anyone who can do the job. Younger women (like younger men) are especially likely to view computer training as a career necessity. At Mount Holyoke College, for example, fully half of the all-female graduating class last year was computer literate, up from only 15 percent 7 years before. Even the Girl Scouts have

## WHAT DO women want? My God, what do they want?

added a computing merit badge to their traditional outdoor cooking and tree-identifying repertoire.

"The problem isn't with the professional woman," according to Katharine Davis Fishman, author of *The Computer Establishment*. "It's with the woman who doesn't absolutely have to learn about computers. Women aren't trained to tinker or to putter with machines just for the sheer fun of it. For example, most of us look at cars as wheels that get you from one place to another, and I think we tend to look at computers the same way." Since toying with the computer is the best way to test it, women end up looking from the

outside in at what they most often see men doing with computers—crunching numbers and killing aliens.

Even those of us who do slip through the cracks and become computer enthusiasts frequently have a lot of catching up to do. I was forced to learn to use a word processor when I was a reporter for a daily newspaper. I was immediately addicted, of course, but when I decided to buy my own computer, I got hopelessly lost in the brave new world of interfaces, cables, RF modulators, and dip switches. Using the PC as my first reference point for electronics was an experience roughly akin to reading both volumes of Julia Child's *Mastering The Art of French Cooking* in order to learn how to make a TV dinner. (I didn't realize until long after I had my PC that concepts like "megaHertz" were general electronics terms, and not computer-specific.) Now I find such things elementary, but then it was scary in a way that guys who've spent years fooling around with wires and tools can't possibly appreciate.

Luckily, it's becoming increasingly unnecessary to turn yourself into a techie in order to buy a computer. That's what "user-friendliness" and such things as service contracts are all about. Which brings us to...

Many feminist scholars have documented the phenomenon of "math anxiety" that often overtakes girls—even math-excelling girls—around the seventh

**Female Anti-Computer Statement #1:** I'm not interested in computers because I'm not good at math.

or eighth grade. "There's no such thing as

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fellows.

a girl nerd," according to Dr. Beva Eastman, assistant professor of mathematics at the William Paterson College of New Jersey. "At that age, all the pressure is on hair-do's and boys and social things. And while it's considered okay for a boy to really just go off on his own and get involved in math and science, it's still considered unfeminine for a girl." Even among graduate students, she added, "the highest proportion of married women students are in math and the sciences. It's as if you have to prove yourself as a woman before you can feel good about stepping into that world." Based on observations from her work as a teacher of other mathematics teachers, Eastman is persuaded that adults don't expect high performance from girls—and consequently don't get it.

Katharine Davis Fishman agrees, "I see an awful lot of parents running out and buying a home computer for 12-year-old Jeremy, but not too many buying them for 12-year-old Jessica."

It's a very likely possibility that the female "math stigma" can be wiped out in a generation, just as the female "sports stigma" seems to be rapidly passing from the scene. But the ironic thing about computers is that they require less and less math all the time. Long gone are the days when novices had no choice but to communicate directly with the binary brain of their machines. Novices now have access to high-level programming languages like BASIC, which are closer to English than to binary numbers. In fact—contrary to widespread misconception—you don't even have to learn a programming lan-



guage unless you choose to. A lot of computer novices, not surprisingly, hear the phrase "word processing program" and assume that it means that programming skills are required to use it. If anything, the trend is in the opposite direction.

**Female Anti-Computer Statement #2:** I don't have any experience doing anything like using a computer.

This one is sometimes uttered by a woman as she pops dinner into the microwave oven, checks her digital watch, and turns on the TV show she's taped earlier on the VCR. "A lot of women have skills that they don't know they have," according to Dr. Paula Leventman, a sociologist who formerly worked for Digital Equipment and is now director of the brand-new Women in Information Systems program at Northeastern University's Graduate School of Engineering in Boston. The program is specifically designed to train women from nontechnical backgrounds for careers in software development and database management, both in the Boston-area computer industry and in fields such as health care, banking, and insurance. "A lot of computer people only know computers," she added, "whereas a fast-track English major who's a good communicator can more easily learn a few computer languages and be very employable."

The skill that most directly relates to a person's potential in programming, according to Dr. Leventman and many others in the computer field, isn't math or science at all—it's music. (Are you listening, all you female piano lesson veterans?)

Frances Quittel, a high technology con-

gives women a learning edge once they actually get to the point of conquering their negative associations and sitting down at the computer. "I've seen an awful lot of English teachers become computer literate awfully fast," she said. Quittel herself was a linguist before she got into the computer field.

Helaine Head, president of the Manhattan Micro IBM Users' Group, noted that even where men and women are equally intimidated by computers, men are more likely to be socialized to confront their fears. "I know several guys who specifically bought computers because they could see that these machines represented a whole new future that they weren't prepared for," she said, "but I don't know any other women for whom that was a factor." Head, whose real-life job is in the theatrical field (she was assistant director and production supervisor for the production of *Porgy and Bess* that opened at Radio City Music Hall in April), is often one of only three or four women among 200 men at computer-related gatherings. "I've also noticed that just the word computer is a turn-off to certain women," she said. "They like the idea of a word processor better. A lot of us remember the days when a computer was this imposing but also fragile thing—the whole 'don't fold, spindle, or mutilate' mentality. If that's your

association, it isn't going to sound like much fun."

**Female Anti-Computer Statement #3:** Computers aren't going to make my job any easier.

On this one, I side with my own sex, and I wish more men would stop and think about what "personal computing" means to workers who spend their time

***THE INDUSTRY***  
*appears ready to*  
*welcome anyone who*  
*can do the job.*

keyboarding somebody's else's "personal" work. "The technology may be neutral, but the fact remains that it can be used to abuse typists by keeping count of the exact number of their keystrokes per minute," Dr. Beva Eastman pointed out. In April, Dr. Eastman addressed a Barnard College Women's Centre conference on feminism and technology, speaking on the subject, "Women's Trauma? Women's Friend? Personal and Political Implications of the

**W**ITHIN THE  
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sultant with The Corporate Service Group Ltd. in San Francisco and an officer of the Bay Area chapter of the Association for Women in Computers (AWC), also stressed that greater keyboard familiarity

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Microcomputer." Ultimately, she came down on the "friend" side (she is hooked on an Apple II), but only after acknowledging all the petty, dispiriting, and dehumanizing uses to which computers can be put in the pink collar ghettos where most women still labor. In any case, she concluded, since computers are a virtual inevitability in the corporate world, it makes sense for women to learn more about

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## **T**HE SKILL *that most directly relates to a person's potential in programming is music.*

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them—and to be prepared to negotiate for optimal working conditions. (For example, Labour Canada's Task Force on Micro-Electronics and Employment recently recommended that typists not work in front of a video monitor for more than 5 hours a day.)

Frances Quittel of the AWC agrees, "There's a tendency in the business world to think of 'women and computers' in terms of becoming better secretaries. Meanwhile, I see guys putting together venture capital deals and all kinds of creative high tech things. I want to see more women doing that, too."

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### **Female Anti-Computer Statement #4:** *Computers May Be Hazardous to Your Health.*

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Since 1979, at least eight clusters of birth defects and miscarriages have been reported in the U.S. and Canada among women office workers using VDTs. According to the industry newsletter, *Micro-wave News*, the clusters include "seven out of thirteen Air Canada employees in Montreal [who] miscarried during one year; three cases of birth defects and seven miscarriages out of fifteen pregnancies [occurring] at a defense contracting office near Atlanta over one year; [and] eight of twelve pregnancies [with] adverse outcomes at a Sears, Roebuck office in Dallas within a fourteen-month period." Expert

opinion is divided over whether such clusters would be statistically likely, even if the women weren't using computers, since some 15 percent of all pregnancies end in miscarriages. Nor is there any consensus on what aspects of computers could be causing the problem, if, indeed, they are causing the problem. Radiation, possibly hazardous insulating fluid, increased stress level—leading to more tobacco, alcohol and Valium use—and even toxic materials from other office machines have all been mentioned.

Various government and industry studies indicate that computers are perfectly safe, but many people are not reassured. More to the point: The health aspect of computers is something women are extremely concerned about—and that men rarely seem to bring up.

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### **Female Anti-Computer Statement #5:** *Computers are cold and mechanistic, and they won't enhance the human dimension of life.*

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Wrong. Probably one of the least publicized technological developments, for example, is the extraordinary work being done with computers for (and by) disabled people. Last year, the National Science Foundation sponsored a contest, the National Search for Applications of Personal Computing to Aid the Handicapped; among the items submitted were a keyboard that can be controlled by eye movements and a computer designed to help deaf people learn to read lips. Other innovations include Braille printers, special security systems to help disabled people call for assistance in an emergency, pocket-sized word processors to help cerebral palsy victims and other speech-impaired people communicate, as well as regular computers, which have opened up new careers for many wheelchair-bound and hearing-impaired people.

Computers can help make art and play music, trace your genealogy, check your spelling, and more. What women don't like about computers really has very little to do with computers. What it does reflect is what women don't like about male culture. Which brings us to . . .

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### **Female Anti-Computer Statement #6:** *I hate those violent, stupid video games!*

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"The reason that Pac-Man was such a

big success, I'm convinced," said Helaine Head, "is that it was the first game that girls and women could relate to. Gobbling up all those little munchies was a whole lot more appealing than starting a war and killing someone."

As virtually every Washington political pundit continually points out, there's a definite gender gap on the American scene, and it comes down to the simple fact that women don't like violence, real or vicarious. While there's nothing intrinsically violent about microcomputers, it's now a matter of historical fact that men got to them first—and, not surprisingly, programmed them chock full of the same sorts of games they enjoyed playing before. Since games are usually the medium through which people are introduced to personal computers, plenty of women don't look past *Three Mile Island* and *Crush, Crumble and Chomp*.

If you go down to your friendly neighborhood computer store and check out the game packages, you'll also notice that most games have white male heroes. There may be a scantily clad space bunny or a passive princess in need of rescuing, but that's about it as far as the role models for women is concerned. Even the nonviolent and otherwise excellent *Microsoft Decathlon* requires that female players pretend to be men. Tootsie aside, would you fellas be comfortable running around your RAM disguised as Billie Jean King?

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## **T**HE HEALTH *aspect of computers is something women are extremely concerned about—and that men rarely seem to bring up.*

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Still more alienating to the average female consumer was the recent disturbing trend toward software that goes beyond mere woman-ignoring to explicit woman-hating. The worst example was a game, *Custer's Revenge*, put out for the Atari by an independent company. The point of the game was to propel General Custer past the usual hellfire obstacles to a



"squaw" tied to a stake—and then rape her. When the General finally scored, the Indian woman's legs went up in happy submission. The game was finally taken off the market after massive picketing and petition-gathering by Native American and women's groups.

Dr. Beva Eastman doesn't think any real progress will be made to interest women in computers until the software market changes drastically. "There have been numerous studies in this area," she noted. "One involved a bunch of first graders learning number facts. The reward was that you got to kill an alien, and the girls just didn't go for it. When the programmers changed the reward to a dog wagging its ears, their motivation picked up." Eastman thinks adult women might like adventure games relating not to fantasy but to real-life problems, such as sexual harassment on the job.

Probably the person who's doing more than anyone for computer parity for girls (and minority boys, and senior citizens, and disabled people, and anyone else who needs it) is Joan Fischer Targ of Palo Alto, CA. Targ is an educator, a member of the faculty of the International Institute on Microcomputers in Education at Stanford University, and president of Interactive Science Inc., a nonprofit corporation that operates the computer center at Palo

alto, and the girl will hang back," she explained. In one particularly significant case, a sixth-grade girl was assigned a boy tutor and her twin sister was assigned a girl. The girl with the female tutor had originally had trouble qualifying for the course. Now she is earning money teaching adults computer literacy on weekends and during summer vacation. Her sister dropped out of the program early on. "It's important that when a girl comes in for the first time, she looks at a class full of strong, competent girls having a good time using the computer," Targ said. "After she has the skills, it doesn't matter. But in that initial contact, kids ought to be able to be confident that their being there is reasonable and appropriate."

Still, there are difficulties. Even where the girls participated in the course and did well, Targ's staff found, they spent less time hacking around on the computers after school and on weekends. "We discovered a couple of things," she said. "One was the safety factor. There's much more concern on the part of parents, especially in the wintertime, that girls come right home from school instead of hanging out. Parents like to know where they are. Girls also seem to have more chores at home, in terms of Saturday housecleaning and so on, and they're able to get out of them less easily than boys. The attitude of the parents is likely to be 'well, he's a helion, but look how smart he is.'"

Another problem, ironically, was competition from after-school sports. "The boys are involved with sports, too, but they don't take certain aspects as seriously. Whereas the girls' coach will tell them to practice 5 days a week and they'll absolutely listen to him and worry about making him mad, the boys will realize that they can take one or two of those days in the computer room, and 'so what if the coach fumes and fusses?'" Targ has countered these difficulties by "giving more structure to the girls' after-school program." When the girls know that they're expected to show up, they do—and their parents are more approving.

A big part of the program's concept is the student as teacher, and kids who've completed the first phase go on not only to instruct other kids, but to help elderly people and other adult members of the community to use computers. (The oldest grad was 93.) In addition to being civic-minded, it's turned out to be strategic as

far as the girls are concerned. According to Targ, the girls "invariably mention that the helping part is one of their favorite things, whereas the boys rarely do. We've obviously tapped into something that's meaningful to girls of this age, but if that's

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what it takes to get them interested, that's okay with me. I'm happy to capitalize on it." Software is similarly based on things kids—especially girls—like. A particular favorite is the mail-merge exercise, in which students pretend to be so popular that they need to write form love letters to their many boyfriends or girlfriends.

Targ pointed out that while girls may be handicapped by their socialization, technophobia is an equal opportunity disease. "I recently read that something like 10 percent of all businessmen get physically ill at the sight of an Apple on a desktop! Can you imagine? Physically ill!"

Katharine Fishman agreed. "I keep hearing stories about computer widows," she said. "But I have an Eagle II, and my husband still doesn't know how to turn it on."

What, you may ask, does All Of This Mean?

If you're a woman reading this, I'd say it's really up to you. Computers aren't a fad; they're arguably the key to the next stage of human development. It would have been nice if we could have narrowed the gender gap, abolished violence, and weeded out the roots of technophobia before the advent of the computer age. But we didn't. It would be nice if there were a Joan Targ in every school district. But there isn't. The only way to introduce an open membership policy to the computer boys' club of America and to make computers serve the kind of future that many women envision, is to get those women involved with computers—now.

Computer widows of the world, unite. You have nothing to lose but your input.

/PC

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**W**HAT WOMEN  
*don't like about  
computers really has  
very little to do with  
computers.*

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Alto's Jordan Junior High School. Close to half of the 700 students who have voluntarily participated in computer training this year at Jordan are girls.

Targ very deliberately encourages female participation by presenting the computer classes outside the aegis of the math classes and by arranging for girls (and minority boys) to be given their initial tutoring by a peer. "We found that if there's a boy around, he'll tend to get aggressive and start taking over the key-



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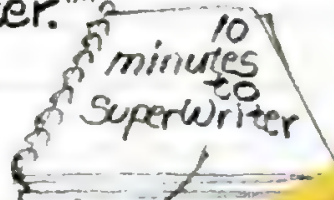
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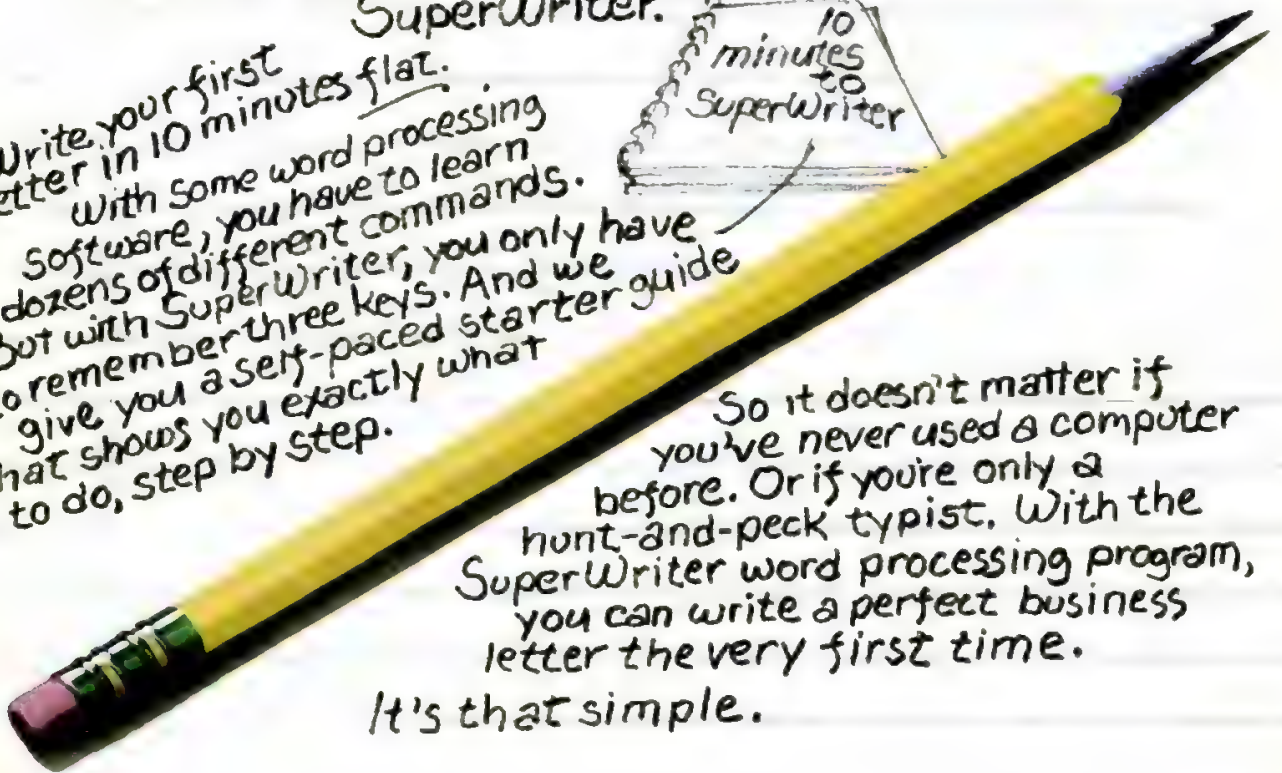
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*Organizations such as DIG SIG, a computer users group from San Diego, set a good example for other PC users. They find ways that computers can help the handicapped help themselves.*

# Helping the Handicapped Through Computers

If someone asked you what segment of society could benefit most from computers, what would you answer? Children? Businessmen? Writers?

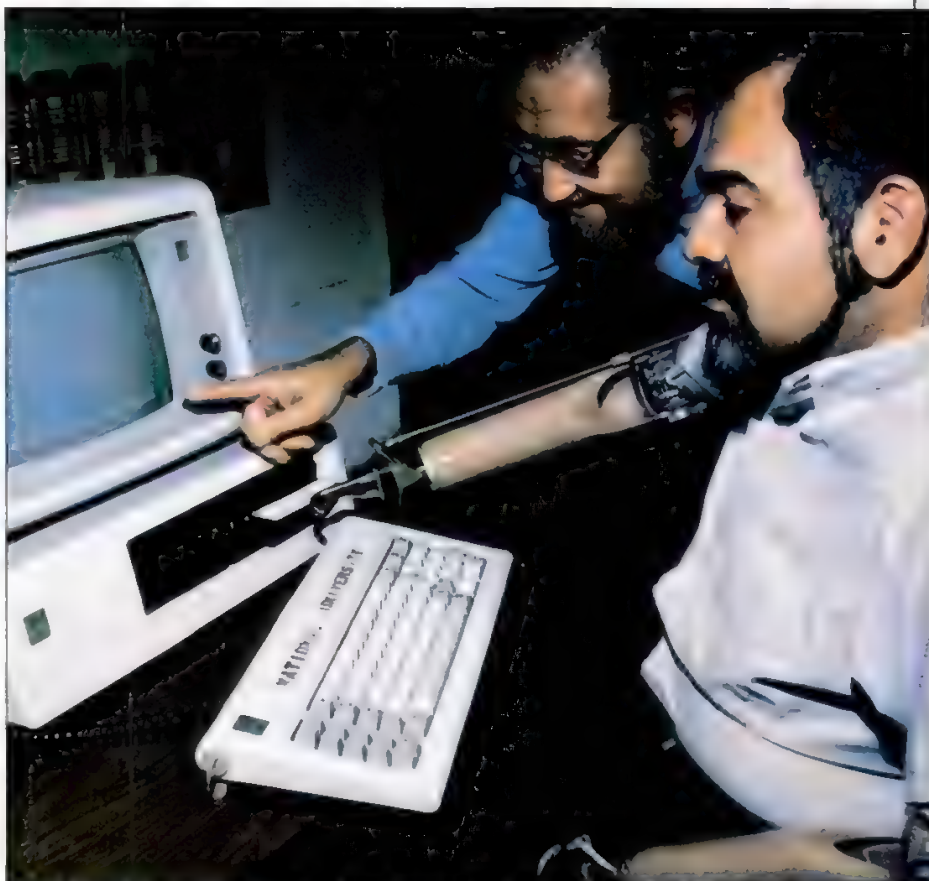
If you were then asked who has the hardest time getting a computer, would you know?

On both counts, the answer is the handicapped.

For those of us who complain because we can't fathom the intricacies of a program or a manual, consider the person who must strike the keys with a mouthstick held between his lips because he has no fingers or no arms.

Consider, too, that such a handicap is only the beginning of that person's frustrations. If the handicapped person has a government disability allowance, he or she is only permitted to own equipment costing up to about \$500, or \$1,500 total assets including other items in the home. Now what if that person were able to earn some money thanks to the independence afforded many homebound people who can use a computer? This would affect his government income or perhaps cancel it altogether, based on the social worker's view of any new found competency.

These three basic problems—using a computer, acquiring a computer, and struggling with the resulting subsidy



Fred Gilbert (seated) and Milton Blackstone of DIG SIG, a San Diego computer users' group dedicated to helping the handicapped, experiment with the PC keyboard.



problems—are only the tip of the iceberg for many handicapped people. If they were given half a chance, they could benefit immeasurably by making the concept of the computerized cottage a reality in their lives. But who will step in and plead their cause? Who can help them tap technology and make it work for them?

### DIG SIG Steps Forward

One answer is every local computer society and users group. A prime example is the Disabled Interest Group/Special Interest Group (DIG SIG), recently formed by members of the San Diego Computer Society. The approach, goals, and interests of this group could easily become the guidelines for other groups hoping to help the handicapped plug into the computer to help themselves.

Usually, these groups contain people with technical know-how who can assist in revamping switches and input devices to compensate for a handicapped person's inability to handle these items. Those of us who are not handicapped don't realize how hard it is for others to perform the simple acts of turning a machine on and off or pushing a disk into a drive and closing the door. Even the act of hitting the Ctrl, Alt, and Del keys simultaneously is a giant hurdle for one whose fingers can barely manage to hit a single key at a time.

Milton Blackstone, the original force behind San Diego's DIG SIG, is new to computers, but not to the problems of the disabled. Blackstone, a retired TV producer, has a multi-handicapped son who is blind. As a result, Blackstone has always been involved with the disabled and with the organizations that devote themselves to their problems. Blackstone realizes how computers can improve the future of people in the handicapped community.

Not surprisingly, all members of Blackstone's family are oriented to the disabled. His daughter, Jana, is a special education teacher married to an engineer. Both are involved in computers.

Blackstone recalled his own immersion into computers: "When my daughter and her husband talked of the technology, it was as though I was an illiterate. I bought a computer in self defense. Within a few months, I approached the San Diego Computer Society with the idea of establishing a group for the disabled. They encouraged me to try it. By the third meeting, we had over 50 members take part in

our activities. This number has doubled during the year."

In describing the primary goal of DIG SIG, Blackstone said, "Initially, we proposed to seek the ways in which a group could help handicapped people take advantage of the new technology as a means of increasing their independence and improving their lives in general. From

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**C**ONSIDER  
*the person who must  
strike the keys with a  
mouthstick because he  
has no fingers.*

---

there, the goals proliferated and we're working to implement many of them."

Any or all of the goals developed by DIG SIG could be tackled and accomplished by other groups. Perhaps you or someone in your group could address the problems of the handicapped and emulate the ideals that Blackstone outlines.

The world of computers has been introduced to a number of newly interested people through workshops and meetings to which the handicapped community was invited. Members of the computer industry were also invited and their enthusiasm resulted in contributions of unused equipment, advice, and individual help. This aspect alone has already resulted in jobs for several of the handicapped members and has allowed them to learn how to use equipment that they can work with at home.

Special switches and other modifications that will help the disabled gain access to their equipment more readily are now being developed. One company has introduced devices that will allow blind or mute people to vocalize their thoughts, opening up a new world for them.

Fred Gilbert, himself disabled, is in charge of introducing aids and special devices for using the computer at DIG SIG. His own apartment is filled with gadgets that could be the dream of any electronics wizard. When the phone rings, Fred doesn't pick up a receiver from a cradle; he simply steps on a switch and talks into

a specially designed telephone. Since Fred can't wear his artificial arms all the time, most of his computer time is spent hitting the keyboard with a chopstick held between his teeth. Disks are inserted into the drive using a clip clothespin, also manipulated with his teeth. Fred is presently developing a call-in bulletin board for the handicapped and is now trying to find money to launch CRIP-Tonics, Inc., aimed to be a bridge between the handicapped and industry, and aiming to fill the needs of both.

### Bulletin Boards

DIG SIG, as a group, is using equipment loaned by the San Diego Computer Society to log into the Society's bulletin board. The bulletin board will enable handicapped members to call in to request help and support, to gain access to public programs, and more importantly, to communicate with others while in a lonesome, isolated environment. DIG SIG members volunteer for consultation time, either by phone or in person, to teach the handicapped how to use packaged software. Fred believes that telecommunications and bulletin boards are among the most exciting computer applications since they enable the handicapped to help one another, functioning as an integrated group even if they are isolated. He points to a service called ABLEDATA, a national data bank for product information developed by the National Rehabilitation Information Center in Washington, D.C., as an important development for the disabled.

As more handicapped people are introduced to computers, they think of ways to solve problems unique to their own disability. Since others are out there with similar disabilities and similar experiences, it's essential that each development be publicized. As Milton Blackstone remarked, "there's no sense in reinventing the wheel constantly."

There are an estimated 12 million disabled people in the United States and approximately 30 percent have college degrees, many with specialized technical knowledge. One elderly member of the DIG SIG group, who became legally blind during his late sixties, spends many hours creating and revising programs that will show other people in the group how to use their computers to overcome specific problems. "By helping others, I help myself," he said proudly. "I'm a useful



member of the community. Every day, I wake up with an exciting goal to achieve. Without the computer, I'd be another nearly blind old man with nothing to look forward to in life. The computer gives me direction, companionship, independence. Sometimes I feel like the Statue of Liberty. You know, 'Bring me your sick, your poor ...' or whatever the quote is. Bring me your computer problems for the handicapped. I'll try to solve them."

### National Efforts

Mentioning robotics as a means of aiding the handicapped caused Fred Gilbert to grin broadly. "What a challenge," he said. "The people who are the most severely restricted offer the greatest challenge for inventiveness and new applications of robotic devices. That's where the future is."

Several national groups have already been pursuing the challenge offered by the handicapped. The Rehabilitation Engineering Society of North America (RESNA), the Medical Engineers, and rehabilitation units of hospitals throughout the U.S. have pursued the challenge offered by the handicapped. The John Hopkins National Search for Applications of Personal Computing to Aid the Handicapped was made possible by grants, awards, and prizes from the National Science Foundation and Radio Shack. Prizes and awards were also offered by companies and institutions such as Adventure International, Apple Computer, Inc., Byte Publications,

## THE GOALS developed by DIG SIG could be accomplished by other groups.

IEEE Computer Society, Martin Marietta, Paralyzed Veterans of America, Popular Computing, Texas Instruments, Inc., and Zenith Radio Corp.

With so many activities on a national level, it behooves local communities to aid the cause of the handicapped in every way possible. Any IBM users' group could easily accept the responsibility of conducting local activities for the handicapped without looking any further than a local hospital with a rehabilitation center or by talking with a member who may have a disabled person in his own family. Indeed, that person may have been the main reason that the computer was purchased initially.

At one of the San Diego Computer Society DIG SIG meetings, I interviewed a man who told me, "My 10-year-old son has cerebral palsy and has difficulty communicating. He used devices and learning stimulation available at his school, but we wanted more. I bought the computer and used some of the existing programs to help him develop greater eye and hand coordination. I extended the handle on the commercial joysticks so Dave could control

them. The game and play situations were only the beginning."

Both father and mother learned to write programs that would help Dave learn by rote and would provide built-in on-screen rewards when he accomplished the objectives. Dave learned to respond to different colors and numbers that had eluded him before.

"There was an added bonus we had not counted on," said the father, "With a computer in the house, neighborhood children filter in and out constantly to work with the computer and to see if they can use the programs we have devised for Dave. As more children are introduced to computers in school, they crave working with them after school. The computer has become a source of technological know-how as well as human companionship for Dave. It has provided the interaction with others we never dreamed would happen."

Today, there are many more programs available for the PC than there were only a year ago and several can be used for finding answers to problems of the handicapped. (It's also possible to adapt programs written for other operating systems to the PC.)

### Communication and Employment

Computer peripherals have enabled some handicapped people to communicate for the first time. For example, voice output aids are now available for the blind. The Kurzweil Reading Machine translates printed words into computer-

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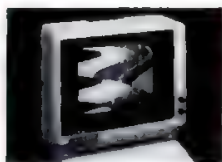
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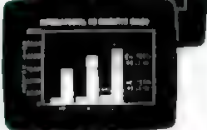
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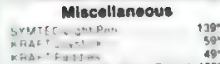
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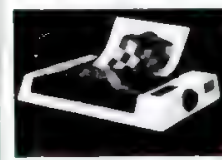


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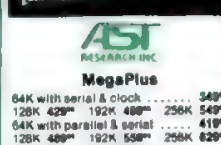
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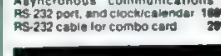
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generated speech. Computers equipped with speech synthesizers or talking terminals let blind people operate advanced computer systems, providing educational and employment opportunities.

## COMPUTER peripherals have enabled some handicapped people to communicate for the first time.

People who are mute or who suffer from severe motor disabilities can use systems that track eye movements on the computer screen. The mouse, joystick, light pen, and digitizing tablet can also be adapted to input and can provide the handicapped with unlimited creative potential. For example, Fred Gilbert men-

tioned that a former magazine editor, 95 percent paralyzed as the result of an automobile accident, can "read" the New York Times on his computer terminal. The man activates the images on the screen by using a blow switch attached to his clothing in a manner similar to touching the screen with a light pen.

IBM is among the growing number of companies that are introducing work programs and opportunities for handicapped people. According to a report in one newsletter, IBM has increased its recruitment and training of handicapped workers. Some companies are encouraging the employment of home-bound handicapped workers, allowing them to receive full company benefits even though they cannot work at the main office.

According to Paul Hazen, director of the John Hopkins program, it's surprising that more computer companies have not looked at the handicapped as potential customers. Hazen estimates that if only two percent of the handicapped in this country purchased a personal computer,

the result would be somewhere around \$800 million in sales or about 400,000 units. As of this writing, no major manufacturers have become directly involved in producing computer equipment for handicapped persons.

What Hazen may not have taken into account is the economic situation of many disabled people. Although a large proportion can afford to buy units, many are subsidized by a variety of social programs, a situation that raises other problems. Fred Gilbert pointed out that people who receive income from a government source can earn only a very limited amount of money before it conflicts with the subsidy. In addition, the amounts they can earn are so small that they can, at best, only supplement the subsidy, not make themselves self-supporting. This system actually seems to discourage the handicapped from supporting themselves.

In order to remedy this situation, the rest of us should investigate and lobby for new laws that will make the computer cottage a viable area of activity for the handicapped in the future. According to Gilbert, any politician who pursues this issue could easily win a place in Congress. He would have the votes of the handicapped and the computer industry, and could save the country money as well.

With so much activity already going on among organizations and industry, PC user groups could make a large contribution toward aiding the handicapped. The catalyst could be one of your own mem-

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**SOME companies are encouraging the employment of home-bound handicapped workers.**

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### Organizing a Group

How can you organize a group such as DIG SIG? Make an announcement, arrange

## PC USER

*groups could make a large contribution toward aiding the handicapped.*

a meeting, send out notices, and establish the needs and goals of the group. PC users are generally logical, organized, and business-smart. They have a great deal of experience and talent at their fingertips. Often they are connected with industries, educational institutions, hospitals, research organizations, and engineering societies, and can contribute a great deal of expertise to the group effort.

The publication Programs For The Handicapped reports that "most envision the computer as the hope of the future for the handicapped and predict strong growth in this area." Certainly, PC users could be among those who help make this prediction a reality in the years to come.

/PC

Dona Z. Meilach writes regularly about computer related topics for many magazines. She is the author of Before You Buy a Computer (Crown Publishers) in addition to 65 other books on a variety of subjects.

### A Note To Our Readers

PC Magazine would like to hear more about adapting hardware and software to the needs of the handicapped. We would also like to learn more about handicapped users employed as computer programmers and consultants. If you have information on these subjects please write to:

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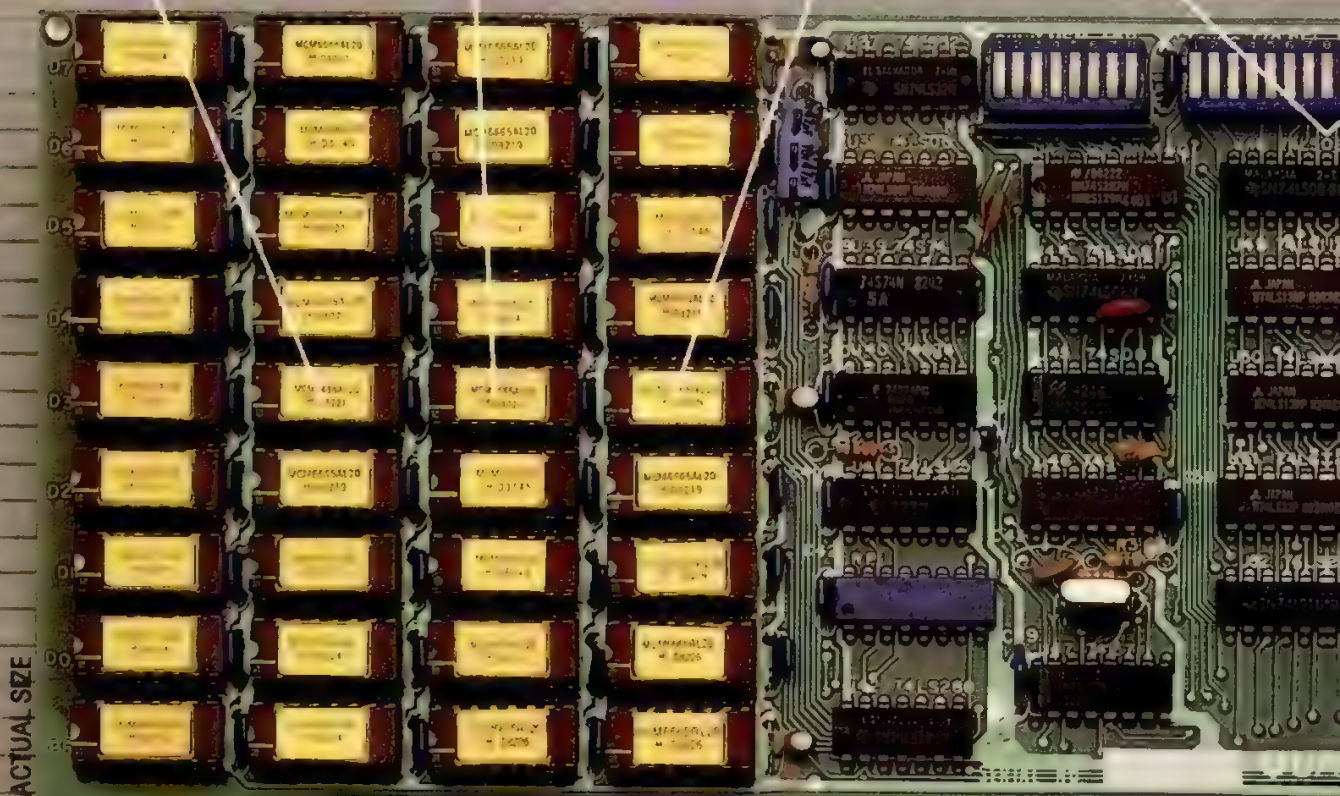
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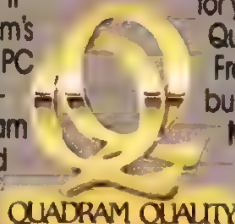
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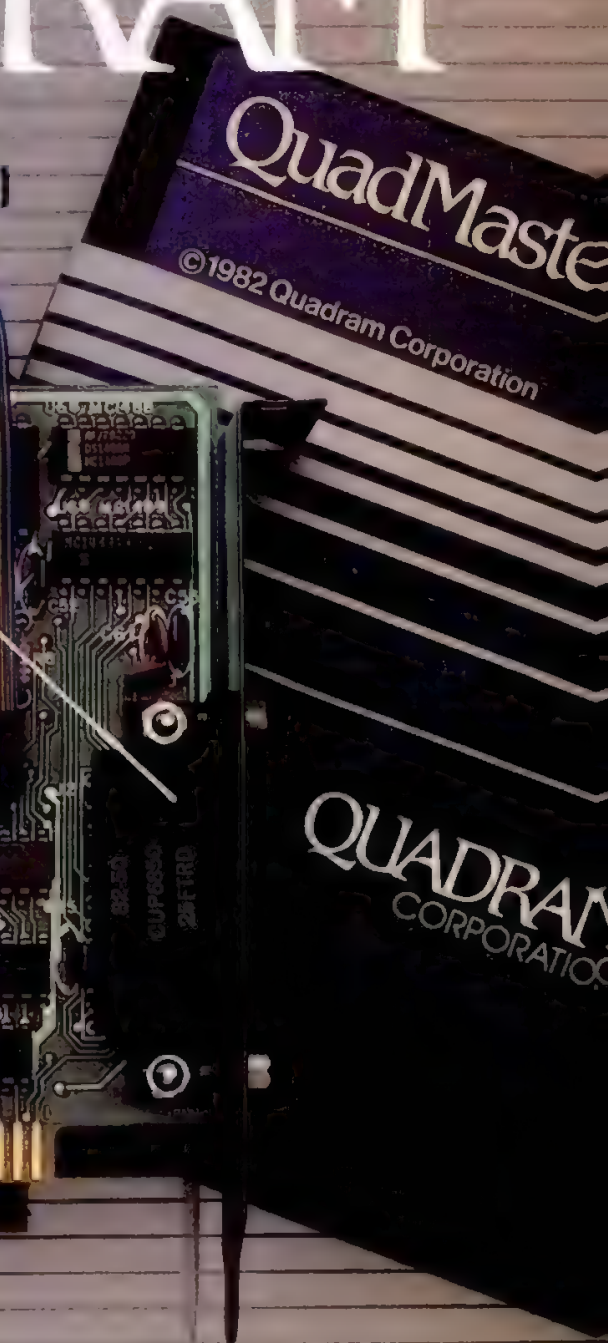
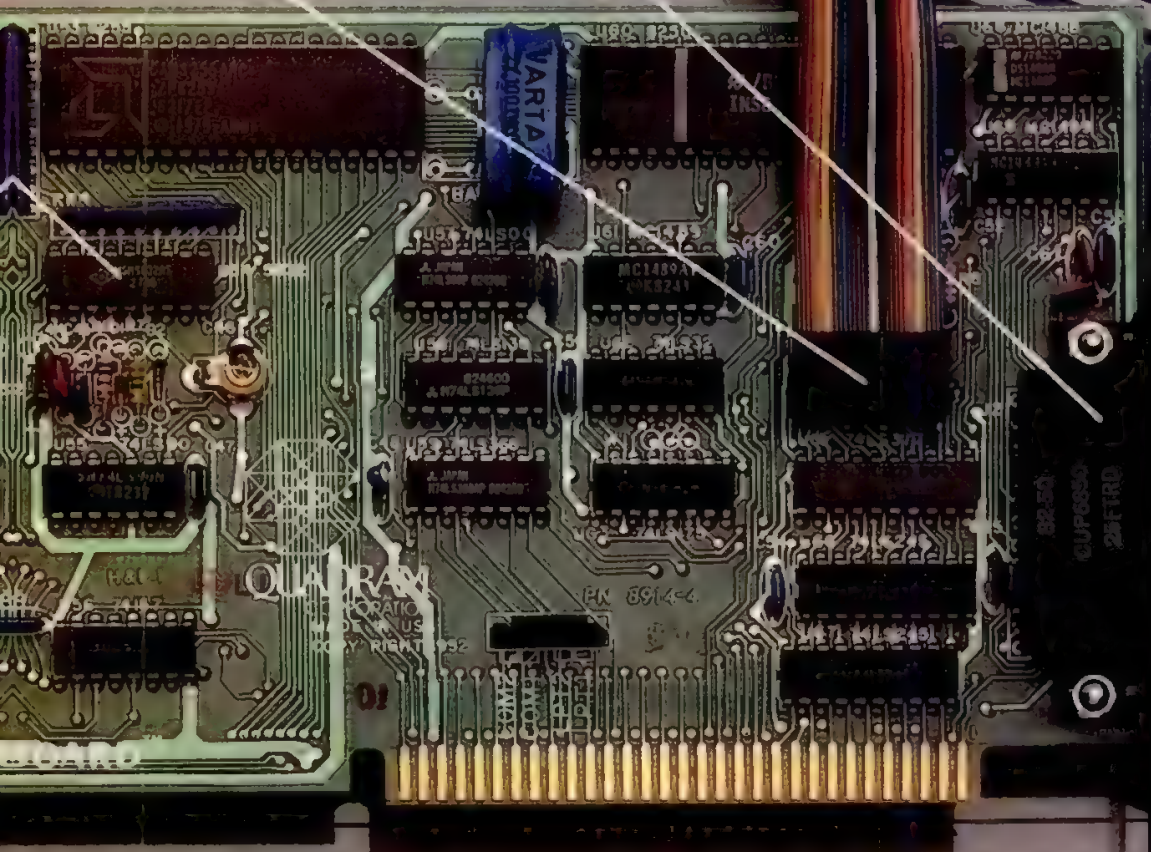
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*Computers can shorten the distance between an idea and a sentence. The question is, "Do they change the sentence itself?"*

# MAKING THE LEAP: A CREATIVE WRITER MUSES ON THE WORD PROCESSOR

**R**ecently I used a word processor for the final rewrite of a book, working from a draft that I'd originally written on an IBM Selectric. I've never been so embarrassed in my life. It was my sixth book; I've earned a living as a writer for the past 20 years. I bought the computer to reduce the manual labor of my work, but in the process I kept finding myself exposed as a fraud. It was the computer that exposed me. I've nursed a bruised ego ever since.

This was a second wave of computer anxiety for me, the first lasting for the several months that I resisted buying the machine. Other writers are conquering their computer anxiety and, in their new freedom, rushing into print with I-love-my-computer stories. None of them, however, discuss the effect of computers on their writing. They're not telling us about the most interesting part of the story.

## Computers Moving In on the Arts

Last June, I attended the International Design Conference in Aspen, Colorado.

**O**TH<sup>ER</sup> WRITERS are conquering their computer anxiety and, rushing into print with I-love-my-computer stories.

An early speaker was Nicholas Negroponte, professor of computer graphics in the Department of Architecture, located at M.I.T. in Cambridge, Massachusetts. At the time, Negroponte was serving as the first director of the World Center for Per-

sonal Computation and Human Resources in Paris, created by the French President, François Mitterand. France, we're told, is going to do computers right.

Negroponte, it was announced, had just received news of the devaluation of the franc. He'd gotten the news in his hotel room at 5 a.m.—some time before newspapers and television had received the word—via his briefcase computer and a telephone hook-up. Having thus wowed the conference with an electronic scoop, he proceeded to tell us tales of chatty computers to come and of the imminent death of newspapers. These stories set the unofficial agenda for the rest of the conference: computer anxiety.

A lot of the assembled designers were already quaking at the prospect of computer graphics, which threaten to overwhelm them with indigestible amounts of leisure time even if they manage to stay employed. Negroponte served up more



quivers. Conferees quickly split into pro- and anti-computer factions. Most of the subsequent speakers chose to insert an element of skepticism into their remarks. The session closed with a debate on artificial intelligence between Hubert L. Dreyfus (who wrote *What Computers Can't Do*) and Marvin Minsky, resident maven on artificial intelligence at M.I.T. Nothing much was solved in their discussion, but the conference was generally electrified—electronicated?—by the lofty and up-to-date nature of the controversy.

Another speaker was Michael Crichton, the Harvard-trained physician who now writes thrillers (*The Andromeda Strain*, *Congo*) and makes movies. Crichton says he isn't writing much right now;

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**C**RICHTON SAYS  
*he isn't writing much  
right now; instead, he's  
computerizing the movie  
business.*

---

instead, he's computerizing the movie business. He nevertheless spoke more directly on the subject of computer anxiety than anyone else at the conference.

Movie-making, he explained, involves a lot of perfectly impossible logistics, such as bringing together 12 green 1948 Dodge stake-bed trucks in Seattle at 3 p.m. next October 4th, and then, after having done this, learning that the trucks are actually needed in Puerto Vallarta next Tuesday. What Seattle really needs on October 4th, it turns out, is four people who can juggle flaming torches, but one of the jugglers has to be fat. Computerizing this sort of scheduling can save a ton of money.

Except there's this "resistance," Crichton says. Movie art directors, for instance, won't hear him. They are artists, they maintain, and their work is purely creative. There is no way to reduce their fine judgments and aesthetic discriminations to the pluses and minuses of computerization. Okay, fine, says Crichton, but what's the most boring part of your job? What do you do badly, what takes too much time and is irritating? What can't you get proper help for; what are your headaches? Cut

out the most exciting and fulfilling part of your job, save that for yourself, give all the rest of it to me, and I'll computerize it.

### Writing with a Chainsaw

Computerizing only the myriad minor details is a seductive argument for computers, and a powerful selling point for word processing for writers, too. Using a typewriter is to using a word processor as using a hand ax is to using a chainsaw. Try getting in a winter's worth of wood with an ax, and you will understand the source of the I-love-my-computer stories. Actually, the chainsaw part of the analogy is a little inexact; the word processor is pleasant to use, and the chainsaw—that despicable little beast of a machine—is the most exhausting tool I've ever messed with. In my experience, no machine generates more anxiety than a chainsaw.

There are other, older writers' stories trotted out to justify computer anxiety. A surprising number of us cling to drudgery as a part of the creative task. We have to keep running the copy through the typewriter over and over again, we claim, because that's the way we do our thinking. I have a writer brother-in-law who once maintained that he couldn't write without a certain kind of yellow copy paper because that was the only material that would properly absorb the ink off the typewriter keys. I recall reading of some wordsmith who typed his manuscripts, taped them to an office wall, retired across

the room, and proofread them through field glasses. Computer-expert Tracy Kidder, author of *Soul of a New Machine*, told me that he can't use a word processor because, as I understood him, his first drafts are almost illegible.

I will bow to no writer in the looniness of my own working habits, but personally, I think we are all nuts.

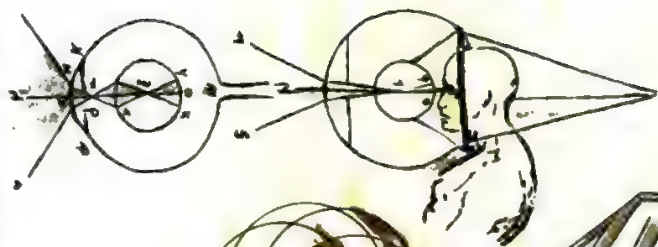
Go nuts for a computer and you will write faster, of course, which is what most electronic writers' stories are about: the computer as chainsaw. I think you will also write better. The chainsaw metaphor is only trying to say that the computer shortens the distance between the idea and the sentence. This is the unexamined part of electronic writing and the source of my embarrassment.

As long as I've been writing I've assumed I was working to increase the effectiveness of my sentences. I had it all wrong. I was simply compiling mental lists of prose gadgets, which, in this case or that, seemed to bang home the meaning a little harder. At some point, probably around my freshman year, my prose gadgets outstripped the quality of my thought, and I've had the feeling I've been cheating ever since.

Shirley Hazzard recently wrote about becoming a writer in *The New York Times Sunday Magazine* ("We Need Silence to Find Out What We Think," November 14, 1982). She sprinkled the piece with pithy remarks about shortening the distance

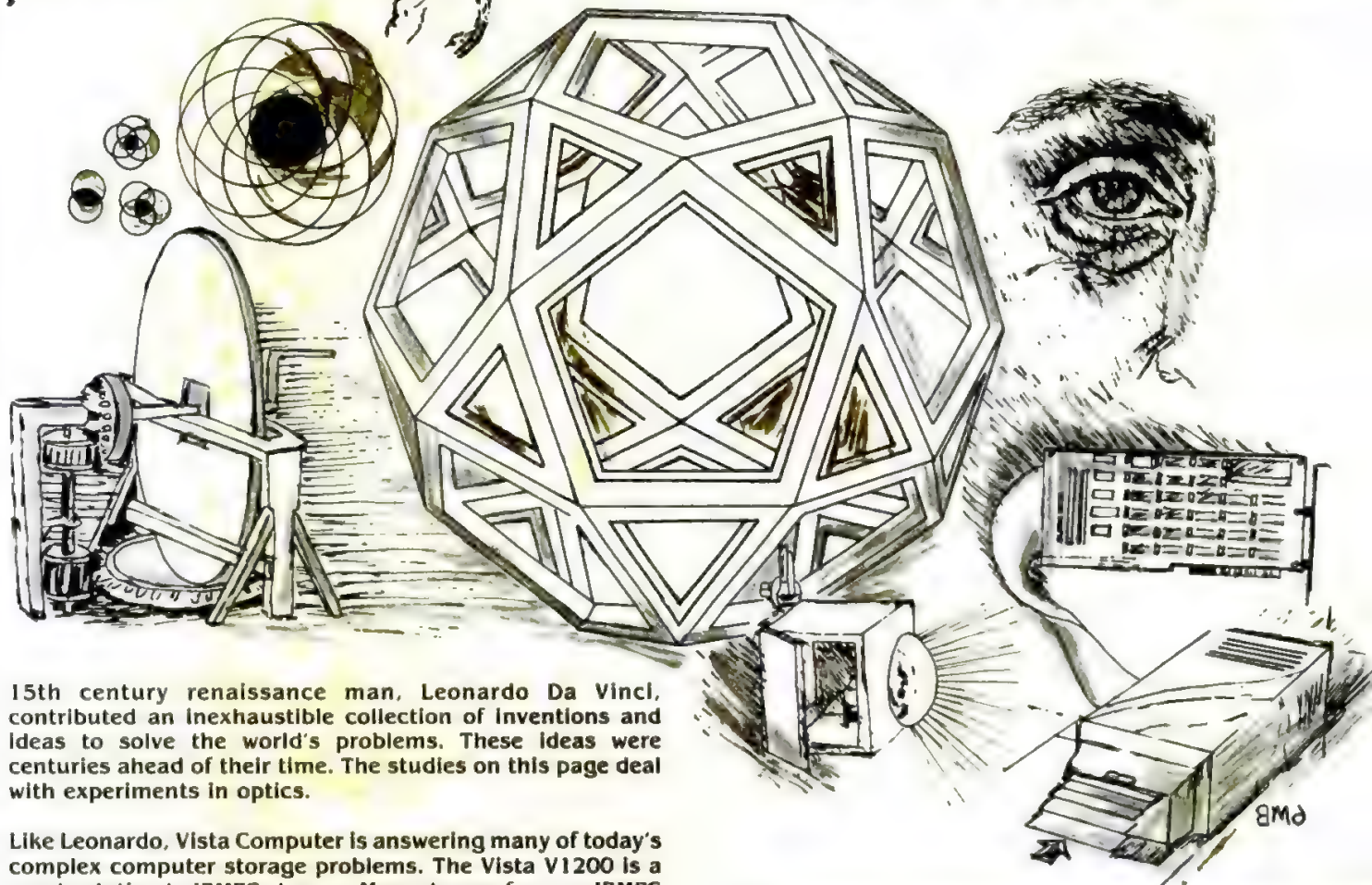






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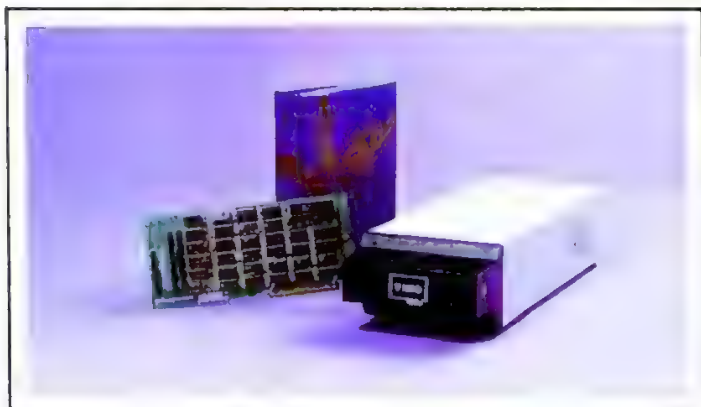
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between idea and sentence. "The testimony of the accurate word is perhaps the last great mystery to which we can make ourselves accessible, to which we can still subscribe," she says. "Every writer who is serious about his craft experiences a sense of profaning pure meaning with unworthy words." She quotes Flaubert (to George Sand): "When I come on a bad assonance or a repetition in my sentences, I'm sure I'm floundering in the false. By searching I find the proper expression, which was always the only one, and which is also harmonious. The word is never lacking when one possesses the idea. Is there not, in this precise fitting of parts, something eternal, like a principle?"

## The Digital Difference

It was the inaccuracy of the word that caused me to blush during my recent rewrite. I had all these habits that I wasn't aware of. Every example was doubled or tripled, underlined, expressed forward and backward (here I go again); every attempt at emphasis racked around into some unnecessarily arch or colorful form. But mostly, time after time, I had simply fudged down onto the page some rough approximation of what I was thinking and then gone on, usually to try the same thought another time or two without getting much closer.

Something about working with the

**I**VE RECENTLY  
been reading about  
"confirmation bias,"  
that tendency we have  
to make only the  
observations that  
confirm our hypotheses.

computer made me more ready to admit to myself that a sentence bothered me. Recognizing this meant recognizing that the sentence wasn't saying what I wanted to say. And this was naturally followed by the realization that I didn't know what I wanted to say, didn't know where the thought was headed, was whistling past the graveyard. It was—is—very embar-

rassing. Almost every trick I ever learned in writing—and I have been guilty of saying that writing was nothing but a thousand tricks—was useful only for disguising an empty sentence. (A few good editors attempted to point this out to me in the past, but I wasn't having any. Hell, I was too good a writer.) Now I have this idea, novel for me, about writing that cuts through all that. I can't do it, of course, but I can conceive it. You might say it is the idea awaiting the word.

What the computer has to do with all of this is the mystery. One clue, I'm sure, has to do with time. The computer automatically elicits hurrying, scrambling, Type-A behavior. It infects you with instantaneousness, with the sense that it should be possible to do everything at the flick of a switch. Once you get used to those little green letters appearing so quickly on that screen, you can't stand it when the machine hums and whirrs for 2 seconds, looking for something else on the disk. Experienced computer-users advise you to buy the fastest printer you can afford, since after the speed of the composing process, waiting for that damned mechanical clatterbox to run off the copy becomes unbearable. Mercedes-Benz diesels once had to overcome a great deal of consumer resistance because you had to wait 5 seconds, after inserting the key, before the glow plug would let you start the car. This sounds idiotic, but it's a maddening delay. That computers generate this fidgetiness is insidious and disgusting and a little frightening, but they do.

After you've worked with a computer for a while, however, you gain some ease and come to know that it's really a chain-saw. You know that it is so fast that the time-consuming production part of the process has become inconsequential. You begin to learn that it isn't necessary to hurry; you've been given so large a slice of extra time that you can afford to be pen-sive and get it right. I am finally losing the urgency to get to my typewriter to find out what I'm going to say next.

## The Stages of Writing

I've recently been reading about "confirmation bias," that tendency we have to make only the observations that confirm our hypotheses. It reminded me of rewriting. At the typewriter, I start out chuckling to myself at my clumsy writing, rolling in yet another sheet of paper as I go through





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the first or second draft of a piece. By the fourth or fifth rewrite I am commiserating with myself for being stuck with this neurosis that forces me to keep redoing a piece until I think it's right. By the eighth or ninth, I am cursing that neurotic need (the sicker aspect of which is a strong aversion to sending off marked-up manuscript), but I'm still doing it. There eventually comes a time when I am reading only to confirm that I have it right, to convince myself that this is the final draft, as good as I can make

## **T**HE COMPULSION to produce pages gets put aside long enough to field-strip, clean, and inspect each sentence.

it. Faced with the prospect of yet another draft, I do convince myself. Confirmation bias sets in. Perhaps there's no way to avoid these stages in the development of an article, but it is possible to expedite the process with a word processor.

Enough of neurotic work habits and pointless details. Let's get back to the subject of writing better. There's as much romanticism on this topic as there is about writers' neuroses. I can imagine a piece of writing in which the ideas are so powerful that the sentences don't matter, but I've never seen one. To the extent that sentences are obtrusive, the power of their ideas is going to be weakened. E.B. White sometimes falls over this edge, writing so well that I spend all my time marveling at the grace and beauty of his sentences, and end up wondering what the piece was about. John McPhee is catching the same disease, more intent these days on bowling us over with what he can pull off than with telling those stories that make him such a good raconteur.

I suspect the job is to wriggle between these two writerly conceits. The first is the neurotic twaddle about only being able to write on ivory vellum when the sun isn't coming in the windows on the southeast side of the house; that is, creative preciousness. The second is the equally romantic intellectual arrogance that only ideas count. Consider most academic

writing, which lets accessibility, even clarity go hang. The little people can work it out. One hires secretaries for spelling, you know.

I'll buy the notion that the word is never lacking when one possesses the idea, but this, too, is upside down, implying that the idea will pop into your head and, with it, the word. It implies thought processes more orderly than I can conceive. I don't think you ever possess an idea until you've wrestled it into the cleanest, clearest sentence you can manage, which may also be a romantic notion. Nevertheless, this, in the end, is what the word processor is best for.

### Computer as Taskmaster

A friend and good writer, Jim Conway, says that one is drawn to the computer prematurely—which is probably true, but dangerous, I think, only if you also leave it too early—and that your sentences “do tend to come out shorter and squarer, as expected in journalism.” (He's working in journalism at the moment, and using a word processor.) I have the oppo-

site problem: The computer strings the words out so fast that I tend to run on and on, and have to go back and chop everything into digestible chunks. My intention is to discard most of the chunks, if I can just maintain the level of attention that lets me see them clearly. They are chunks of ego, of course, and throwing them out is hard.

But the point is that I can go back and chop so easily, and therefore I will. The process is enough fun that I'll go back challenged, instead of resignedly enduring the drudgery. The need to produce pages gets put aside long enough to field-strip, clean, and inspect each sentence. (I hope someday to be able to work my way up to doing the same with each paragraph.) In the process I find that I am more likely, eventually, to possess the idea.

The chainsaw image comes back: The word processor clears underbrush, from having to return the carriage, to rolling in the paper and worrying about the end of the page, to feeling the increasing tension as you come to the last stages of what you hope is going to be a usable page you don't



*“Whither goeth literature, Emily, there also must I go.”*



want to screw up now and blow 30 minutes of mindless labor. Every bit of this underbrush is inconsequential detail as far as the creative process is concerned. We all believe that. But every bit of it is also distracting, pulling some tiny part of your mind away from wrestling the thought into the sentence.

From this completely mechanistic set of concerns, extrapolate on up through the less purely manual labor of writing. Electronics give you complete freedom to invert and switch and fit, to try new constructions, to flip up onto the screen any glimmer of an improvement, consider it, judge it, wipe it out, or nail it into place. Michael Crichton also says there may well be too much freedom with the tool, that eventually you have to stop diddling, bite it off, go to print. I'm sure there's an exquisite decision to be made there, too, but I haven't come to it yet. I'm still looking for ways to improve the process.

A writer I know wrote a 900-page novel in one draft. He figures that fiddling with sentences and finding more graceful ways of saying things is not going to sell more copies than just getting it said the first way. He'd rather go on to work on other things. This attitude hurts my feelings, for reasons I'd rather not examine.

**I DON'T CARE IF  
the images are  
technically accurate or  
not, since they enable  
me to process words  
easily on the machine.**

I think it's also possible to extrapolate upward from what I'm saying about sentences, but I know my own thinking about larger blocks of work gets fuzzy. In rewriting a 20-page chapter on a typewriter, by the time I get to the last five pages, I have little memory of what was in the first five. The computer takes about one-sixth the time, and over this shorter period I am much better able to keep in mind what I'm driving at, to pursue a straight line to the end of the segment. I think. When every chapter has its own disk, when you can so quickly flash onto the screen whole new

units, I think it is easier to see the project whole, to keep the requisite number of balls in the air. It's easier to try new juxtapositions, new relationships. I'm not entirely confident of my judgment about this, but it seems easier, and I certainly welcome that.

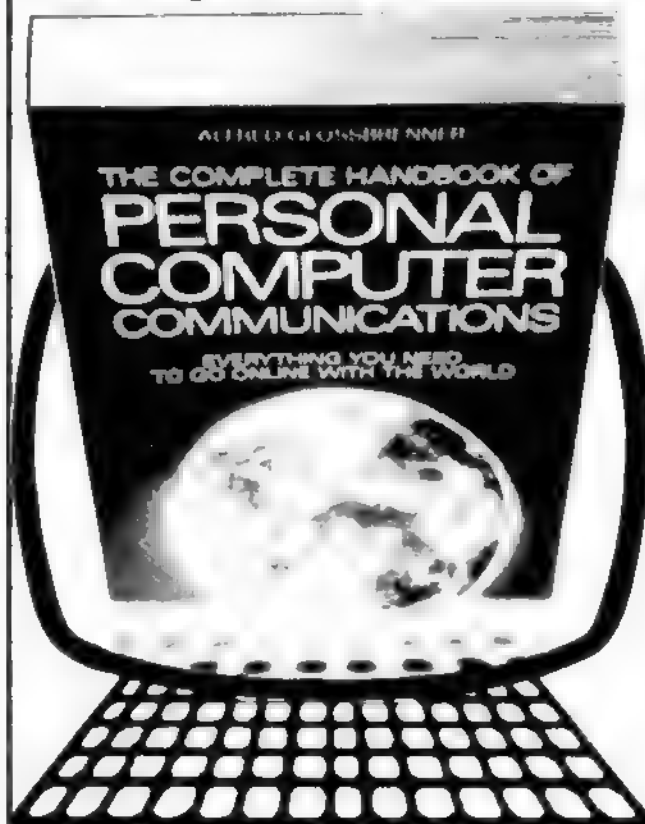
I'm more interested in why, other than for reasons of handiness and mechanical ease, the computer permits this deeper penetration of one's own work. Why do I find that flashing green electric letters make visible my own confusions, expose my secret fraudulences?

### Computer Metaphors

Learning to operate the computer was for me a process of acquiring some new metaphors. I'm reasonably good with machines, but this one was frustrating and incomprehensible at first. I was thinking in the antiquated gears and levers of my own pre-electronic mechanical universe. Eventually I began to get comfortable with it, and one day it just cracked open for me. As I worked I began to envision what was going on inside the machine through a new set of personal metaphors. These have to do with wiring grids and storage spaces, with zipping electrons being sent to this or that address, with direct lines of access and efficient routings. I understand the process of retrieval of stored information, for example—if I understand it at all—by a set of mental images. These images are inescapably stylized, for me, by all the computer graphics in TV ads these days. For others the images may come from computer games, which I don't play. I don't care if the images are technically accurate or not, since they enable me to process words easily on the machine.

When Jim Conaway remarked about sentences that came out shorter and squarer, he was responding to an early complaint of mine as I struggled with the computer. I'd begun to want my information in shorter and shorter bits, preferably Anglo-Saxon. I'm sure this is a direct outcome of the computer's Type-A syndrome. I suspect it's also linked in some cognitive way to television's brief attention span. (After 30 seconds without a picture change, a TV producer once told me, a talking head fades into unintelligibility no matter what it's saying.) I told Conaway that if we all use computers for 50 years, there won't be any three-syllable words left in the language. This was early in my word-process-

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—Gary G. Reibsam, Vice-President of NewsNet Inc.

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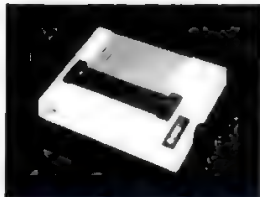
## Dot Matrix Printers

Since an IBM PC can drive almost any parallel printer on the market, software compatibility is critical. The larger your software library, the less likely a given printer will work with everything. It's a process of elimination. So if you're just beginning, choose software *before* you choose hardware.

Remember, too, that *no printer* is 100% compatible with the PC except the PC printer—Epson, Gemini & Mannesmann Tally printers are the next best things, respectively.

EPSON

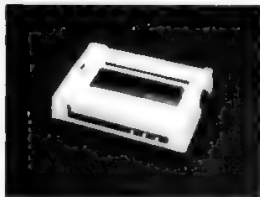
## FX, MX & RX



The **MX-80** set new standards for dot matrix printers years ago. IBM graced it with their logo. Nevertheless, Epson has reshuffled the product line. The **FX-80**, a Prowriter competitor, features 160 cps, a correspondence font & a new body (tractor is optional). The **MX Series** is being phased out & the **RX Series** will replace it. Call for the latest version & the best prices.

C. ITOH

## Prowriter

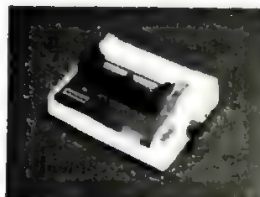


This printer is a major contender. Reviewers laud the **Prowriter's** speed (120 cps), the buffer (1.5K), character sets (5 fonts) and graphics (160x144 dpi). It's the printer of choice for several major OEMs. The **Prowriter 2** has the same specs, but in a 136 column format. Because delivery is slow nationwide, the **Prowriter** has become "The Printer Worth Waiting For..."

Prowriter ..... **\$399.88**  
Prowriter 2 ..... **\$734.88**

STAR MICRONICS

## Gemini 10/15



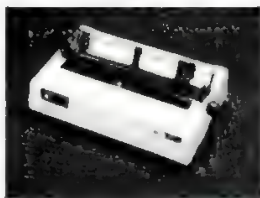
**Gemini** printers have been getting a reputation—a good one. At 100 cps,

with 120x144 dpi, 5 fonts (w/italics) and a 2.2K buffer, it's a match for both the Prowriter & the Epson (it's Epson code compatible, too). **Gemini** comes with tractors & uses plain spool ribbons. The **Gemini 15** is the 136 column version.

Gemini 10 ..... **\$339.88**  
Gemini 15 ..... **\$499.88**

OKIDATA

## Microline Series



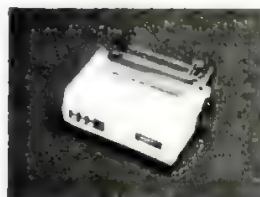
We use these printers in our offices. **Microline 82As & 83As** are data crunchers with 120 cps and optional dot-addressable graphics ROM.

The **Microline 92 & 93** are text processors with 160 cps draft mode, a 40cps correspondence mode & the graphics included. The **Microline 84** combines full graphics & speed (200 cps) with exceptional performance (we use the 84 to print our invoices).

Microline 82A ..... **\$419.88**  
82A/92 Tractor ..... **\$59.88**  
82A/83A Okigraph ROM ..... **\$49.88**  
Microline 83A ..... **\$679.88**  
Microline 92 ..... **\$624.88**  
Microline 93 ..... **\$884.88**  
Microline 84 ..... **\$1024.88**

MANNESMANN TALLY

## MT-160 L



The **MT-160 L** is the newest of the correspondence quality printers. It has speed (160 cps), 8 fonts, parallel & serial interfaces, friction/tractor feed, plus menu-driven installation for easy set-up from the control panel.

MT-160 L ..... **\$789.88**

We sell other dot matrix printers, including the Anadex Series, Centronics Series & IDS's Prism Series. Call (603) 881-9855 for technical details. For prices, or to order, call (800) 343-0726.

## Letter-Quality Printers

Letter-quality printers are business machines, & very high-ticket ones at that. Most individuals should buy a dot matrix first, adding letter-quality when it's needed. If you *must* have letter quality first & foremost, back yourself up with a cheaper dot matrix for drafts: they're faster & the letter-quality printer is reserved for final drafts.

C. ITOH

## Starwriter

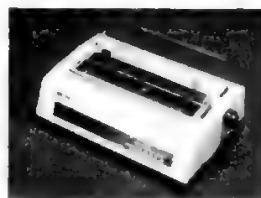


The **Starwriter**, released last year by C. Itoh, has proven a worthy printer. You don't trade-off speed for price or quality. The **Starwriter** uses Diablo code, wheels & ribbons, has a 40 cps print speed, 1/48" line space, 1/120" horizontal spacing—ideal for proportional modes. (For real speed freaks, there's the **Printmaster**, at 55 cps. Same specs as above.)

Starwriter Parallel ..... **\$1379.88**  
Printmaster Parallel ..... **\$1679.88**

DATA TERMINALS & COMMUNICATIONS

## DTC 380Z

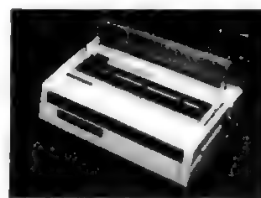


The **380Z** is a letter-quality printer that rivals and replaces the Daisywriter 2000. It has the 48K buffer, true Diablo emulation & uses the Brother/Daisywriter supplies. The documentation is great, & the **380Z** even has pin-outs on the back for easy interfacing (parallel or RS-232C). Eat your heart out Daisy!

DTC 380Z ..... **\$1139.88**

SILVER REED

## EXP-550

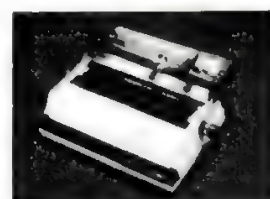


Why buy a Transtar when you can buy from the guys who make them? The Silver Reed **EXP-550** is a 16 cps, 132 column letter-quality printer with *true* Diablo emulation, making it compatible with most word processing software. It's ideal for medium duty office work. Add a buffer & you'll have a versatile printing system.

EXP-550 (Parallel) ..... **\$719.88**  
EXP-500 ..... **\$CALL**

SMITH-CORONA

## TP-1



The **TP-1** is an ideal second printer for small offices or homes. The tractor feed (now available) enhances its paper handling. If you're letter-quality needs are light, this might be the machine. (Specify 10 or 12 cpi when you order.)

TP-1 ..... **\$CALL**

We sell a variety of other letter-quality printers, including the Diablo 620 & 630, the NEC 3530, 3550 & 7730 Spinwriters, the Qume 11+ & many others. Call (603) 881-9855 for technical details. For prices, or to order, call (800) 343-0726.

## Accessories

We carry the accessories below as well as others too numerous to mention, like cables and diskettes. Ask if you don't see it listed.

QUADRAM

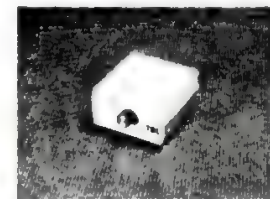
## Microfazer

Quadram's **Microfazer** is a stand-alone buffer that can be expanded to 512K—that's about 200 pages. External buffers can be moved from system to system, & they leave your PC memory free. The copy feature lets you print unlimited copies of a document. Comes with its own cable. The power supply is optional.

8K parallel/parallel ..... **\$154.88**  
64K parallel/parallel ..... **\$219.88**  
256K parallel/parallel ..... **\$629.88**  
512K parallel/parallel ..... **\$979.88**  
9 Volt Power Supply ..... **\$19.88**

TBL PRODUCTS

## Printer Switch



We finally found a printer switch box that we like. Switch between two printers, in parallel/parallel or serial/serial versions (all female plugs).

2-Way Printer Switch ..... **\$119.88**

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## Printer Paper

Our pin-fed fanfold paper is 20lb white bond, shipped in a sturdy case. There are two sizes: 9 1/2" & 14". The wider paper also comes in green-bar.

Paper (9 1/2") ..... **\$44.88**  
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## 64K Chips

We carry 6164s, 200 nanosecond-type memory chips for upgrading your IBM PC peripheral boards. They're sold in sets of nine each, & we have quantity pricing for even bigger orders. We also have 16K chips (9/set) for upgrading the PC's mother board.

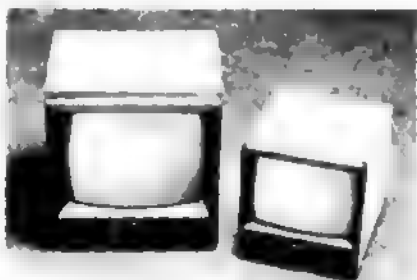
64K Chip Set ..... **\$79.88**  
16K Chip Set ..... **\$29.88**

## Monitors

Here the "eye of the beholder" holds against any spec's. Our favorites are listed below. Remember to get the Color Graphics Card, not the Monochrome adapter.

USI

## Pi Series



We're still using a **Pi-3 Amber** that we advertised last summer. The 20MHz bandwidth gives the highest resolution available, & we like the no-nonsense case & controls. Uses both SO-239 or RCA phono jack. Cable is optional.

Pi-2 (12" green) ..... **\$159.88**  
Pi-3 (12" amber) ..... **\$189.88**  
Pi-4 (9" amber) ..... **\$159.88**

PRINCETON GRAPHICS

## HX-12

The **HX-12** is, without dispute, the highest resolution RGB available for the PC. 16 colors (using NEC's tube), 690 dots by 240 lines, 15MHz bandwidth & more. The **HX-12's** case styling is identical to IBM's. It comes with its own cable.  
PGS HX-12 (RGB) ..... **\$529.88**

QUADRAM

## QuadChrome

The **Quadchrome** has the same spec's as the HX-12, but with the Quadram name. Same price too.  
Quadchrome (RGB) ..... **\$529.88**

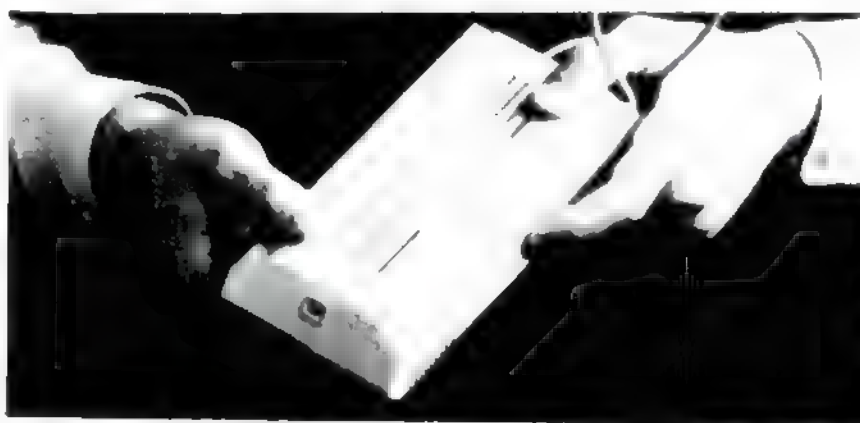
We also carry Amdek Colors 1, 2 & 3, Electrohome's 1302-1 & 1302-2 Series, NEC's JC-1203, Quadram's QuadChrome & Zenith's ZVM-121. Call (603) 881-9855 for technical details. For prices, or to order, call (800) 343-0726.

## Modems

There's a boom on in telecommunications, and to be part of it you need a modem & software. As with printers, the software determines most things, like support of the modem's features (the "bells & whistles") & the ability to communicate with a given device. *Check things out!* Communications can be a nightmare if you're guessing, & easy as pie when you know what you're doing.

## US Robotics Password

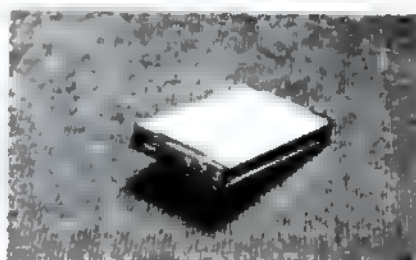
**\$379.88 UPS DELIVERED**



An exceptional value for a 1200 baud modem. The **Password** is a direct connect originate/answer type modem with 0-300 & 1200 baud capability (Bell 212A compatible). Features include auto dial, auto answer, auto mode and auto speed select, full & half duplex (local echo), DTR override, RS-232C pins 2 & 3 reversible & audio phone line monitor. Single button operation makes the **Password** very easy to use. Comes with an RS-232C cable, power supply & modular telephone cable.

DC HAYES

## Smartmodems



The Hayes **Smartmodem** has earned an enviable reputation for quality, reliability & performance. The **Smartmodem** features full/half duplex, auto dial/answer, program-mability in any language, English/numeric result codes & either 300 baud (Bell 103) or 300/1200 baud (Bell 103/212). It comes with modular cable & power supply. The RS-232C cable is optional.  
Smartmodem (300) ..... **\$219.88**  
Smartmodem (1200) ..... **\$539.88**

We also carry the Novation Auto Cat & SmartCat Series & US Robotics. Call (603) 881-9855 for technical details. For prices, or to order, call (800) 343-0726.

## Expansion Boards

AST RESEARCH

## Megaplus

The **Megaplus** uses one slot, but it has one parallel port, two RS-232C ports, a clock and software (SuperDrive & SuperSpooler). Add more memory in 64K increments up to 256K. The **MegaPak**, at 256K, is a piggy-back card.  
64K Megaplus ..... **\$339.88**  
256K Megaplus ..... **\$499.88**  
Megapak 256K ..... **\$289.88**

I/O+

The **I/O+** has a parallel port, a RS-232C port, a game port, a clock & software, but no memory.  
I/O+ ..... **\$199.88**  
Connect All ..... **\$24.88**

QUADRAM

## Quadboards



We sell **Quadboards** because they consistently perform better than any other board we've seen. They come with 64K & 256K on-board, a parallel port, a RS-232C port, a clock & the software (QuadDrive/Spooler). The **Quad 512+** is a memory board with a RS-232C port. Single function boards are also available. Quadram products are warrantied for a full year.

64K Quadboard ..... **\$279.88**  
256K Quadboard ..... **\$429.88**  
**512+ Expansion**  
Quad 512+ (64K) ..... **\$239.88**  
Quad 512+ (256K) ..... **\$399.88**  
Quad 512+ (512K) ..... **\$599.88**  
**Memory Only**  
64K Memory ..... **\$199.88**  
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192K Memory ..... **\$309.88**  
**Single Function Cards**  
Clock/Calendar ..... **\$89.88**  
Parallel Card ..... **\$89.88**  
RS-232C Card ..... **\$89.88**

QUADRAM

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A real breakthrough! **QuadLink** lets you run Apple II/II+ /Ile software in the IBM PC. It's like having a 64K Apple computer installed in your PC. **QuadLink** uses standard PC printer ports, monitors, etc. No disk conversion or reformatting required. Takes up only one slot.  
QuadLink ..... **\$549.88**



## Disk Drives

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20Mb Hard Disk ..... **\$2369.88**  
40Mb Hard Disk ..... **\$3539.88**  
Big Blue ..... **\$479.88**

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## Disk Controller

These controllers fill the bill for anyone building the PC from scratch. The **Maynard Floppy Disk Controller** handles two internal drives (A & B) plus two externals. Comes plain, with a parallel port or with a serial port.

MFD Standard ..... **\$159.88**  
MFD w/parallel ..... **\$219.88**  
MFD w/RS-232C ..... **\$259.88**

IBM PC COMPATIBLE

## Disk Drives

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Sorry, we cannot accept open POs or extend credit/terms at these prices. APO and foreign orders are not accepted.

We prepared this ad in April, & prices do change, so call to verify them.



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CIRCLE 152 ON READER SERVICE CARD



ing career, but I still think this shortening of units of thought is one of the computer's less benign effects.

That effect is balanced, I hope, by the usefulness of the metaphors by which one operates the machine. I think the computer's reduction of the distance between the idea and the sentence is one of those metaphors. Once you start using mental pictures of information routes and direct lines of access to think about the writing process, you begin to rethink the structure of your sentences. No, that's not right, you aren't thinking about the writing process, you're just searching for the cleanest structure with which you can display the idea. Once I became committed to reducing the distance between idea and sentence, I began to get the confidence to kick loose all (well, some) of those gadgets by which I habitually propped up the rickety structure of my thought. Organ stops are what they are; this old metaphor is perfectly apt. They are only tricks that slow the electron in its passage by diverting it from the straightest possible line. Elec-

tron, in this case, is a metaphor for comprehension.

Or maybe not a metaphor; scientists distinguish between those parts of our thought processes that are hard-wired into

## ***T**HE COMPUTER shortens the distance between the idea and the sentence.*

our brains and those that are not. I wouldn't be surprised if comprehension didn't occur at the closing of some hitherto-open circuit, allowing neural signals to flow unimpeded. Maybe that solid click of comprehension, the feeling that makes you say, "Got it," is a bunch of neural switches flipping into place, electromagnetic contact made across the synapses. It feels that way to me since I have been writing electronically.

## **Are Programmers Immune?**

I don't want to know anything about programming, but I seem to remember reading somewhere, probably in Tracy Kidder's book, that programs don't have to be very efficient. The computers have so much memory available that the programmers can take any old route, use unnecessarily complex and cobbled-up means of getting from point A to point B within the program. That immediately implies that there are sloppy programs and elegantly simple ones, and programmers to match. Maybe I do want to know about programming. I think I'd like to be able to understand what would make a program elegant. I think this would teach me something about sentences.

Or maybe not; it doesn't seem to help the computer people. There may be a reflection of sloppy programming in the legendary unreadability of the printed matter that accompanies computer gear. All instruction, for hardware or soft, is perfectly impenetrable. If this material represents the quality of the mental pro-

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cesses of the programmers, one doesn't dare think about the hidden contents of their programs. My wife is a professional proofreader, and much about computers offends her. As she points out, a misplaced comma—or any other symbol—can wreck a program. How can these people, who must be so precise with computer symbols, be so blithely uncaring about the other symbols, the ones that make up their previous language? Okay, I'm not ready for programming yet.

### Electronic Thinking

I have no sense as to whether this computer infiltration is working for good or ill, but I do think it is already changing us. By some combination of subliminal imagery and practical demonstration, computers are teaching us to think, to work, in different ways. The difference seems syntactical somehow, which is why I think it'll show up most emphatically in electronic writing. It's very stimulating, as change always is. I think it's weird that in all the computer talk these days, I haven't heard anything about this from other sources. I'll bet the cognitive scientists are already hard at work on these things. I'd check it out, but I find their writings more impenetrable than computer instructions.

I know what I hope the word processor does for me: I hope it keeps teaching me more direct ways to get from the idea to the word. So far it keeps teasing me with visions of bony sentences, of sentences that slip home the idea of how electrons zip through the circuitry. I keep imagining bits of light that arrow through unimaginable microcomplexities, that snap unerringly into the heart of the remaining discontinuities. These visions make me want to write sentences that don't do anything but fill the last gap necessary to make the idea come clear. I notice that I continue to fail, but it's fun trying.

For me, the switch to a computer has been very fruitful. The only problem is, sometimes I don't know whether I can deal with the density of ideas generated for me by this particular junction of writing and electronics. I said density, I didn't say anything about quality. /PC

John Jerome is the author of *The Sweet Spot In Time* (Summit Books and Avon), and is a frequent contributor to *Esquire* and *Playboy*.

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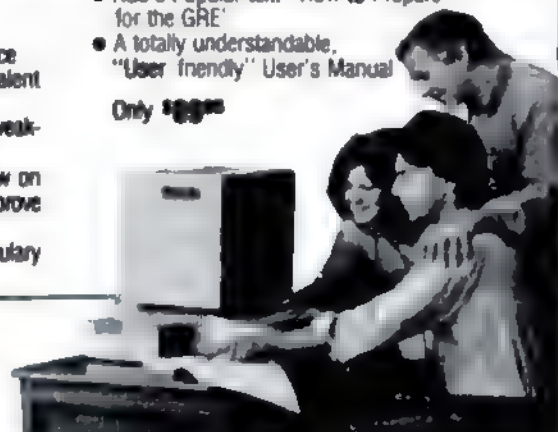
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Quadram Corporation calls it Quadlink: a new product as unusual in concept as in design. What it does is let your IBM Personal Computer act like an Apple II. The design phase for the Quadlink card is completed. Quadram has been tooling up and expects to begin delivering Quadlinks by midsummer at a retail price of \$680. The card is aimed at large companies that already have a substantial investment in Apple software. It will allow a company to purchase IBM PCs without having to sacrifice its investments in Apple software and documentation.

Other potential users might include schools that wish to train people on different microcomputers. With Quadlink, a single PC accommodates software designed for at least two different computers.

The Quadlink fits into a single slot in the PC expansion bus. The PC disk-controller cable is plugged into the Quadlink and connects from there to the drives.



Figure 1: An IBM PC running Apple software using Quadlink by Quadram.



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Also, the PC video display cable is routed through the Quadlink. According to

---

## **C*****ERTAIN** software that uses half-track copy protection would not run on the PC due to differences in the drives.*

---

Quadram president, Tim Farris, installation will be easy. The prototype I looked at had a number of cables sticking out through the rear of the PC's case.

Quadlink shares the PC drives and display. You can use the PC with standard PC-DOS and two drives or run the special Quadlink program and have, in effect, an Apple with the same two drives. There is no need to unplug the video display; the display is automatically switched to the Quadlink display.

The Quadlink display seems to mimic the Apple display perfectly. Even the imperfections apparent in a 24-by-40 display designed for color TVs were visible on the prototype configuration. Quadlink does have one advantage. You can plug it into an RGB monitor as well as a TV and get a higher-quality display.

Although the card seems to contain circuitry that acts like the Apple disk-controller card, I was told that certain software that uses half-track copy protection would not run on the PC due to differences in the drives.

Rather than put the Apple ROM on a Quadram card (potentially a litigation-inspiring maneuver), Quadram elected to provide 80K RAM of memory on the Quadlink. This allows the card to be loaded like an Apple language card and to accommodate boot programs that can talk to the PC serial and parallel ports.

Thus, the Quadlink provides an Apple emulation with disk-drive controller, video display, 64K of usable RAM, game port, and the 6502 microcomputer, all on one card. Of course, with the PC, you also have an upper and lower case keyboard. All serial and parallel communications (as

well as the keyboard control) take place through the PC. Although the prototype hook-up did not produce any sound, I was told that Quadlink will also share the speaker with the PC, so that shoot-em-up games can have the proper noises.

### **Exceptions**

The most-likely problem with the Quadlink is copy protection. Many of the Apple programs are copy-protected by using a technique called "half-tracking." With half-tracking, information is actually written between the usual tracks on a disk. Software copy-protected in this way will not run on the Quadlink card.

Another thing to watch out for are programs that read the Apple keyboard ports or serial and parallel ports directly. Because these functions are built in on the Quadlink, this approach will not work.

Some Apple software also uses pieces of the Apple ROM that exist at specific locations (much like the PC software interrupts). Although I don't know for certain, my guess is that some of this software will not work with Quadlink.

If you have visions of setting up a bunch of pseudo-Apples using a number

of Quadlink cards in a single PC, you can also forget that. A single PC cannot accommodate more than one Quadlink.

It appears as if a large proportion of the available Apple software will run using a PC and the Quadlink card. Quadram insists that about 90 percent of the Apple software runs; in this manner, but the sample was too small to be typical.

The Quadlink card will run on a PC-XT, but it cannot take advantage of the XT hard disk.

### **My Observations**

I went down to Quadram with a pile of Apple software to test. Due to a misunderstanding, I did not have the opportunity to try the prototype. After a short interview with Mr. Farris, I found out that the prototype had been whisked away for further software development (despite the fact that my previously-sealed software had been opened). One can only wonder.

Anyway, I did get to see the prototype running something that certainly looked like Apple DOS. It signed on with the usual Apple II prompt and the funny looking 24-by-40 display. We also got to try one game, and it appeared to work satisfacto-





rily. Certainly the graphics looked excellent, although no noise came from the speaker. The Apple disk is considerably slower than the IBM disk.

If Quadlink works at least as well as the prototype I saw, it probably deserves applause. Designing a full Apple II on a single IBM PC expansion card is no mean feat.

### Quadlink and the Apple IIe

Quadlink was designed to emulate the Apple II. Any software that runs on the IIe and also on the II, should run using a Quadlink card. Software that takes advantage of new features of the IIe will probably not run using Quadlink. Quadlink does contain an upper- and lower-case keyboard, a feature both the IIe and the emulation share. Another common trait is the 64K, which comes standard, not expandable, on Quadlink.

### Summary

Cards such as the Z-80 CP/M-80 emulators have been, well, not overwhelming successes. In part, this was due to the rapid conversion of existing Z-80 software to

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**YOU WOULD**  
*certainly have to be a  
games fanatic to be  
willing to spend \$680  
just to transport your  
existing library of Apple  
games to a new  
machine.*

---

the IBM PC. The 8088 microprocessor in the PC is very much like the Z-80 processor, so that software conversion was a fairly simple task. Also, most Z-80 applications assumed characteristics that the PC shares, such as a 24-by-80 display and a full ASCII keyboard.

The Apple, on the other hand, is so totally unlike a PC that converting applications is a far more difficult task. A 6502 microprocessor chip (used on the Apple) has a completely different instruction set and register setup. The display on the

## The Short Sweet History of Quadram

*In this business quick response time is as important as a good idea.*

Quadram Corporation was formed in 1980 by Tim Farris and William Strange. Tim Farris has a background in engineering and manufacturing, while William Strange has a background in marketing and finance. They made a very good team. Strange is former owner of a retail computer store, and as a result Quadram's products were aimed at that market.

Quadram's first few products in early 1981 were add-on cards for the Apple II and some printer buffers (the Interfazer and Microfazer line). When the IBM PC came out in late 1981, the partners rushed down to the local ComputerLand. They were excited by the technical documentation, and actually designed their first card for the PC (a 192K add-on memory card) from the manuals alone. The product was out in less than 2 months. Other products for the IBM PC (a dual printer card, a battery-backed-up clock) followed quickly.

In early 1982, Quadram counted about ten employees and could boast of a modest sales record. Strange's experiences on the road for the company led to the decision to take the four previous cards and integrate them into a single (and very suc-

cessful) unit, the Quadboard.

Today, Quadram has about 200 employees. It still sells plenty of Quadboards

---

**FARRIS INSISTS**  
*that Quadram has no  
plans to produce a  
microcomputer of its  
own.*

---

and MicroFazers and is beginning to branch out into other products. Farris insists that Quadram has no plans to produce a microcomputer of its own. It is strictly an enhancements manufacturer.

All production on Quadram products takes place in Atlanta. The company is finishing a new building, which will contain three times the space that Quadram now occupies. —M.S.

Apple comes standard with graphics; the resolution is different from that available using a PC color/graphics adapter. The memory organization of the two machines is quite different. Finally, the Apple is a fairly old, static design. This has caused program designers to use characteristics that are more hardware-dependent than those dictated by CP/M-80, which is naturally hardware-independent.

The end result is that the Quadlink provides a far cheaper solution to running existing Apple software than converting the software to a PC. Conversion would imply essentially rewriting the software and documentation from scratch.

However, I am not so convinced of the

need for an Apple emulator. My subjective opinion is that, apart from games, very little substantive software exists for an Apple. VisiCalc does run on an Apple, but VisiCalc files are completely portable from machine to machine. And the instruction set is nearly identical.

Time will tell, but you would certainly have to be a games fanatic to be willing to spend \$680 just to transport your existing library of Apple games to a new machine. Perhaps Tim Farris is right that the best prospects are companies that would like a more capable computer that does not make existing software, training, and documentation obsolete. Hope they don't pick a IIe. /PC



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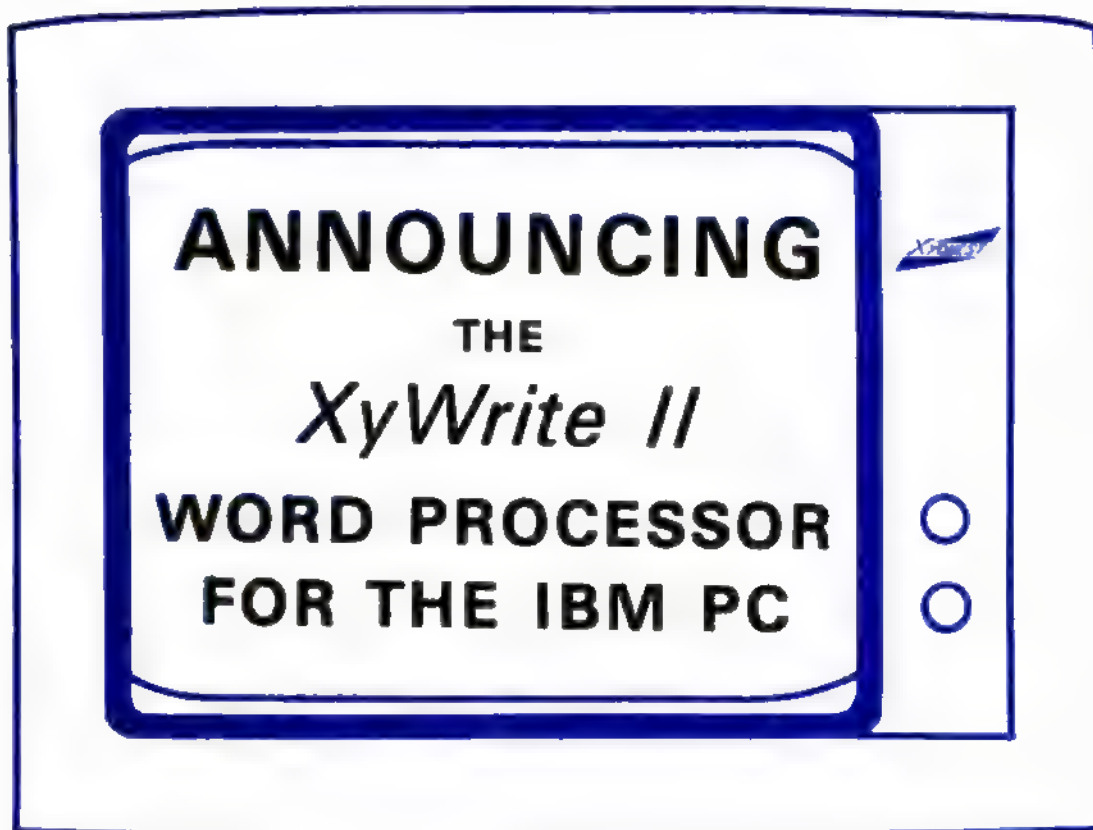
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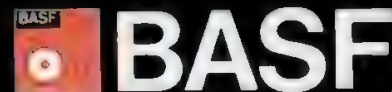


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CIRCLE 699 ON READER SERVICE CARD

**T**hey call the Compaq a portable; I would call it a "movable." It's not exactly as convenient as a pocket calculator, unless you have an awfully big pocket—big enough to carry the equivalent of a 28-pound sewing machine around. Still, the Compaq is infinitely more portable than the PC. You can pack it up and put it down elsewhere without much trouble.

The Compaq lists for \$2,995, a price that includes 128K RAM, a sharp 9-inch green phosphor monitor, color/graphics and text display card, a parallel printer port, and one double-sided disk drive. A second disk drive is \$595. The machine is said to accept any expansion card designed to run on the IBM PC.

I gave the machine a pretty rough test. After using it for a week on my desk, I packed up this near-clone of the PC and took it home for the weekend. Now, understand that home for me these days is a bit of a trek. First the Compaq and I endured rush hour on New York's Lexington Avenue uptown subway to Grand Cen-

tral Station. We didn't get much respect, either, particularly when we became temporarily wedged in the narrow confines of the turnstile. Then we got on Amtrak's

my bum knee still throbbed, the Compaq worked as well as ever.

## But Is It Compatible?

As I mentioned, the Compaq is a near-



Compaq with side panel lowered to show part of interior.

Electric City Express for the nearly three-hour ride to Albany, New York; the Compaq sat up top in the luggage rack.

We arrived home late and I just couldn't wait to find out how well the machine had taken its first train ride. I unsnapped the keyboard, removed the cardboard protectors from the disk drives, and fired up the computer to begin writing this review. Though my arms ached and

clone of the PC—and almost a full work-alike. To put it another way, if 28 pounds of rock is a "0" on a scale of compatibility, and the IBM PC is a "10," the Compaq portable would score high, about a "9.7."

Nearly every program that runs on the PC works on the Compaq immediately, and most other PC programs can be made to run after a bit of fiddling and disk-operating-system swapping.





Interior of Compaq. Monitor is at lower left, drives at lower right, ad-on boards and half of mother board at top.

## ***T***HE COMPAQ CORPORATION has released a list of nearly 100 programs it says will run on the machine.

The Compaq comes with Microsoft's MS-DOS 1.1 operating system, which is almost identical to PC-DOS 1.1. Also included is a version of Microsoft GW-BASIC, also nearly—but not exactly—identical to IBM BASIC 1.1. It is, however, significantly different in the manner in which it is entered into the computer. Compaq's BASIC is resident on disk (a whopping 54,000 bytes or so) and not in a proprietary ROM à la IBM. What are the implications of this arrangement? To begin with, you cannot load IBM BASIC into the Compaq because it immediately looks for instructions from the ROM chip, which isn't there. You can, however, run

Compaq's BASIC on the PC, but you would have to make allowances for a very large language file.

What will the Compaq run? Any Word processor, spreadsheet, utility, or game based on PC-DOS 1.1 should work on the Compaq, provided that the COMMAND.COM file comes with it. You may have problems with programs that look for the firmware ROM of the IBM machine for copy-protection or other purposes. The Compaq Corporation has released a list of nearly 100 programs it says will run on the machine. The software includes 1-2-3, IBM Accounts Payable, IBM Accounts Receivable, IBM Asynchronous Commu-

nications Support, CP/M-86 Operating System, Crosstalk, dBase II, EasyWriter 1.1 and II, MBA, Multiplan, pfs:file, pfs:report, TIM III, UCSD Pascal, VisiCalc,

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Volkswriter, and WordStar.

I wrote parts of this review on the Compaq, using PC's COMMAND.COM and the PC versions of Wordstar 3.2 and ProKey. Later, I ran the same disks in the PC in my office. I was also able to bring up Spyder, a game reviewed in Volume 1 Number 12 of PC Magazine, but only by loading the game from a PC-DOS A> prompt rather than from an MS-DOS A> prompt.

The use of BASIC and BASICA on programs common to both machines presents another area of complexity. As students of the IBM PC know, the machine itself did not represent a breakthrough in technology at the time of its introduction. In essence, IBM took existing technology and packaged it in a competent and attractive unit. The areas that could be patented and copyrighted were few, basically involving the ROM chips, which bring the computer to life, provide instructions on various utility functions for input and output of data, and supply part of BASIC. One peculiarity of IBM's set of ROMs is the division of the BASIC programming language into three parts: Cassette BASIC, Disk BASIC, and Advanced BASIC. The cassette part of the language on the IBM machine is wholly resident in ROM; Cassette BASIC is the BASIC language display that comes up on the screen of an IBM Personal Computer if there is no disk mounted in the A drive at boot-up. If you use a cassette recorder for entry and storage of programs, Cassette BASIC is as much of the programming language as you will have access to. The next



two segments of BASIC on the PC are supersets: Disk BASIC builds upon Cassette BASIC; Advanced BASIC (BASICA) builds upon both Disk BASIC and Cassette BASIC. The version of BASIC on disk is therefore incomplete. When you enter BASIC or BASICA, the machine loads the needed constituent parts from both ROM and the disk.

Not so on the Compaq. In developing their clone, the makers of the Compaq had to find a way to make their machine as much like IBM's as possible without violating copyrights. Consequently, the portable clone has its own Basic Input/Output System (BIOS), which, while functionally equivalent to IBM BIOS, is distinguished by a different design and its own version of BASIC, in this case loaded from the operating system disk. The Compaq has eliminated the seldom-used cassette port (something IBM also did in its new PC-XT extension) and with it, Cassette BASIC. As a result, users are presented with just two levels of the programming language: BASIC and BASICA. The system disk includes three files: BASIC.COM (502 K), BASICA.COM (500 K), and BASICA.EXE (53,760 K). So though the BASICs are functionally the same, you cannot run IBM BASIC on the Compaq.

To use the Compaq, you must be certain that your programs contain the appro-

### The Clones Are Sent In

Time was when expensive pieces of electronics were treated like fragile holy shards, never to be touched or (Heaven forbid!) bounced or jostled. Even when the supposedly sturdy microcomputers made their appearance, most owners felt that their devices had to be treated with the respect ordinarily accorded a vial of nitroglycerine. Of particular concern were the disk drives, with their precise alignments and delicate record/playback heads, and the glass video-display tube.

It took Adam Osborne to bring the microcomputer out of the sacristy and into the hands of taxi drivers, bellhops, and luggage handlers. His Osborne I, by most standards a significant business success story, was the first of the "portables." The machine looked like a cross between an Army mobile telephone and a Singer sewing machine. Its tiny 5-inch (diagonal measurement) white-on-black screen was its primary drawback.

Next came the Kaypro, which took the same basic ingredients (including the 8-bit CP/M operating system) and added a 9-inch green phosphor monitor and larger

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limit all under-the-cover  
work to authorized  
dealers.

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capacity disk drives. The Kaypro looked like a bomb-squad oscilloscope in its "strictly-business" metal case.

And now, the Compaq—the first of the portables to use the Intel 8088 central processor, and therefore the first that can legitimately claim some measure of com-

Front view of Compaq showing graphics on monochrome screen.



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priate version of the language. You may, for example, have a program that requires booting up under IBM's PC-DOS and Compaq's Microsoft BASIC to run. In any case, it would probably be to your advantage to buy a copy (at \$40) of IBM's DOS, though this is not stated in the Compaq manual. DOS 2.0 works on Compaq, but with the same exceptions for BASIC.



# COMPAQ: A Technical Overview

*Good design and sturdy components set this portable apart from other "me too" PC imitators.*

The Compaq Portable Computer offers IBM-compatibility and some portability. Its case is designed to withstand the rigors of transport from one place to another. The keyboard snaps onto the front of the machine, covering the 9-inch monitor screen and the disk drives. Two sliding locks hold it in place. The power cord nestles into a recess covered by a sliding door with a positive detent lock. When the door is removed, the recess is the exhaust port for the system's cooling fan. You can't close the door when the power cord is in place, so you don't have to worry about cooking the innards. Everything outside is tough molded plastic.

## Inside View

All the components are held securely by aluminum cages and brackets. Screws and locknuts abound; nylon standoffs prevent the main board from flexing. A lid goes over the top of the expansion slots to prevent cards from coming loose. The overall impression is one of solidity and quality. There can be no doubt that those who engineered this machine were serious about the possible negative effects of

controller. The motherboard has the usual 8088 running at 4.77 MHz, supported by the 8259A interrupt controller and the 8237 direct memory access (DMA) controller. There is a socket for an 8087 math chip. I was somewhat surprised to see that there are six 28-pin sockets for read-only memory, with two of them occupied by 2764 ROMs. The sockets are selectable by dip switches on the motherboard, so there is quite a bit of room for expansion or for custom software to be burned into ROM. The folks at Compaq have no immediate plans to use the extra ROM sockets.

RAM memory is abundant: 128K is soldered in, and there are sockets for another 128K. Our test machine had the full 256K complement. The address decoding is done by custom-programmed array logic (PAL) chips, and the board is designed to accept 256K memory chips when they become commercially available. New PALs and 256K chips will permit the theoretical maximum of one megabyte to be held on the motherboard, but the actual amount will be somewhat less due to decoding restrictions for the ROMs and other pre-allocated memory addresses.

## Display

The video display board has the standard 6845 colorgraphics controller chip and is capable of driving the internal monitor or the external monitor of your choice. Character generation is a little different on the Compaq. The computer uses a very dense display mode for its internal monitor, giving beautifully-formed, highly-legible characters. They are reminiscent of the quality you get from one of IBM's mainframe terminals. This display mode is incompatible with most external monitors, so an alternate, compatible display mode is provided. The Ctrl-Alt > and Ctrl-Alt < keys toggle the display from one mode to the other. The IBM-compatible mode is coarser, but not objectionably so.

During my tests, I hooked up a new

IBM color monitor to the Compaq and found that it needed the coarser mode. I keyed in the command and was greeted by

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commercially available.*

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a bright flash from the Compaq's screen and a distinct click from inside the machine. It sounded very much like a high voltage arc. I toggled the mode a few more times and found that the sound was being produced by a relay in the video monitor. Out of curiosity, I called the manufacturer to ask for an explanation of what was going on in there. It turns out that the internal monitor actually uses a different scan rate to display the characters, and the video board has a different character set that maximizes readability. There is also an additional graphics character set accessible by changing a jumper.

## Disk Drives

The two standard-height floppy disk drives are unexceptional. The controller card handles just two drives. On the aluminum chassis, mounting holes for a pair of half-height drives in the A position are readily discernible. The people at Compaq aren't confirming or denying, but it looks as if the next model will have two half-height drives and a Winchester. What the people at Compaq will confirm is that they are doing some extensive investigation into those Winchesters they consider rugged enough to be lugged around.

The power supply, at 120 watts, is cer-

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of its being trundled  
around.*

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its being trundled around. It is rugged.

There are five expansion slots on the motherboard, with two of them filled by the video display card and the floppy disk



tainly robust enough to handle two half-height drives and a Winchester. It turns out that the existing supply is capable of handling 120 or 220 volt input, but there is no provision for switching to 220 outside the case. An upgrade will soon be offered to correct this—good news to international travelers (and their ranks are growing) who need to take their computers along.

#### The Keyboard

The Compaq uses Key Tronic's "soft touch" keyboard. There has been a lot of controversy about the feel of this keyboard. The Key Tronic board does not have the "over-center" snap action of the IBM keyboard, but it does have a form of tactile feedback. Each key has a two-stage spring, a light one for the first half of the keystroke and a heavier one for the second half. Key closure is made just before the transition point, so when your finger feels the higher resistance, you know that con-

on the IBM keyboard, simply because you have to actuate the clicker. On the Key Tronic board, you do not have to bottom the key to get a clean keystroke with feedback. If you are feeling particularly ham-handed, the heavier spring that soaks up the second half of the stroke absorbs your pounding nicely. Second, the over-center click has what I consider a fatal flaw. Essentially, the click is too loud and the springs resonate. So you hear these continual tings and pings as you key away. I find it annoying. Key Tronic makes this keyboard in a number of keyboard layout versions. This one is a clone of the IBM layout. I would have preferred one closer to the Selectric layout. Perhaps there will come a day when you can choose your keyboard layout when you buy your PC or PC-compatible machine.

The worst thing about the Compaq's keyboard is the coil cord attaching it to the computer. It is too short and stiff to allow you to move the keyboard any appreciable distance from the machine. It is also permanently attached at both ends.

#### Compatibility Problems

When the Compaq was in development, there were some compatibility problems with some of the commercial programs written in BASIC for the PC. Some of the critical timing loops were written in BASIC and involved operating system calls through the ROM. Compaq's ROM executed these calls faster than IBM's, causing problems. The cure was to lengthen the execution times of some of the routines. The manufacturer claims that other efficiencies in its ROM cause the machine to be faster overall, but the difference is scarcely noticeable.

In summary, I like the Compaq a great deal. It is well-engineered and has many nice features that set it apart from the "me-too" IBM imitators. The packaging is excellent and the documentation is on a par with IBM's. —Bill Machrone

patibility with the IBM PC. This portable is also the first of its kind to have a "finished" appearance. The outside case (made of a solid plastic) looks like a sewing machine, but once you open the case by unlatching the keyboard at the bottom, an attractive desktop microcomputer is revealed. On the model I reviewed, two 5¼-inch double-sided Control Data Cor-

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manuals.*

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puration floppy disk drives sit side by side on the right. (The lowest-price configuration of the Compaq includes but one floppy drive.) On the left sits a 9-inch (diagonal measure) long-persistence green phosphor monitor. A single rotary control allows adjustment of screen brightness.

Two compartments are built into the sides of the machine. The left section stores the electrical plug and houses the on/off switch and a mini fuse compartment. On the right side is the access panel to the five expansion slots. The Compaq is sold with cards in two of the slots: the display card, with outputs for external composite or RGB monitors, and the disk controller, with a parallel-printer output port.

The keyboard, manufactured for Compaq by Key Tronics, is attached to the computer by a coiled cable. The board features Key Tronic's standard soft touch, which some typists love and others loathe. (See "Key Tronic's Soft Touch," PC Volume 1 Number 9.)

A sturdy, well-padded retractable handle provides the carrier with a touch of comfort.

In the best clone manner, the Compaq provides three near-twins to the IBM manuals. The three slip-cased ring binders—Operator's Guide, BASIC Reference Guide, and DOS Reference Guide—are very well presented, and are in many ways an improvement in

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tact has been made. You don't have to think about this; the feedback just becomes part of the typing process.

From the standpoint of quality of tactile feedback, nothing surpasses the over-center form, but there is more to keyboarding than over-center clicks. First, the length of the keystroke tends to be longer



both writing and organization over the IBM originals. There is, however, one very important omission: The guides lack instructions on how to remove the cover of the Compaq, how to install options, or how to set system switches.

### The Disassembly Line

Perhaps emboldened by the fact that we did not own the Compaq but had borrowed it from the manufacturer for purposes of review, we decided to figure out how to open up the case by ourselves. It

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**T**HE LONG-persistence 9-inch green monitor presents one of the sharpest images I've seen short of a plasma display.

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wasn't easy; there are no visible screws or clips on the outside. We finally determined that a pair of screwdrivers twisted into two of the unmarked slots on the side would pop off the plastic outer shell.

Inside we found a sturdy metal cage surrounding the electronics. The cage serves not only as protection but also to cut down on radio frequency interference from the machine. Working again on instinct and not instructions, we loosened six screws and removed the cover over the expansion card bus. Directly in view were a pair of system switches very much like those on the IBM PC. In our experiments, we used the IBM Guide to Operations and other IBM literature to set the switches.

Perhaps it is Compaq's aim to limit all under-the-cover work to authorized dealers. It would seem that if one of the selling points of the company's portable is the fact that most or all of the hundreds of hardware options for the IBM can be used with the Compaq, then the user should not find such obstacles in his way.

### Does Compaq Pass the Test?

Probably. But not without attention. Within a week of arrival, the little red light on the A disk drive gave up the ghost. The very quiet drive continued to work well.

About a week later, the letter U on the keyboard began to generate double letters from time to time. A while later we noticed an intermittent flickering of the monitor, a condition that apparently cured itself (perhaps when it was jounced the other direction). These are not irreparable problems, of course, and they could easily crop up on any computer, but they may also be indicative of the worries the owner of a portable machine may face.

When you purchase a new IBM PC or a new disk drive, you receive a free accessory—a disk-sized piece of cardboard that fits in the drive and prevents the heads from chattering together in transit. In most cases, the cardboard is dumped inside the PC packing crate and left untouched until or unless the computer is to be moved or shipped. Obviously, a portable computer like the Compaq is expected to be moved regularly, and one would think there would be a more permanent solution offered. What comes with your purchase? The same cardboard separators.

I was also a bit discomfited by the manner in which the keyboard was attached. The cord from the keyboard was tightly wound and permanently affixed to the computer. I found it difficult to keep the keyboard at a comfortable distance from the monitor—it kept wanting to slide forward to rest against the computer itself.

### Some Pluses and Minuses

A few nice touches: In compensation for its reduced size, the long-persistence 9-inch green monitor presents one of the sharpest images I've seen short of a plasma display. The demonstration programs that come on the Compaq DOS disk are very well-designed and include a "laser" that paints the company's name on the title page and a cute trademark "bug" that traverses the screen. The demonstration also includes a diagnostic testing procedure that allows you to run through the full battery of tests without having to stop and respond to each "error message" as it occurs (a procedure adopted by IBM in its PC-XT diagnostics program).

A few annoying minuses: The Compaq produces a subtle little click over its speaker as each key is depressed, a nice touch considering the silent and (to some) indistinct feel of the keyboard. However, the manual advertises a control to increase or decrease the loudness of the clicks,

using the Alt key and the plus (+) or minus (-) key. Try as I did, I could discern no change in volume. Further, the computer's fan is noticeably noisier than the PC fan, sometimes to the point of distraction. This is probably due to the demands of the larger power supply and the built-in monitor, which produces some heat. Nor was I satisfied with the angle adjustment for the computer/monitor. Two sets of legs can be extended, but I found the monitor too low for comfort. I ended up propping the Compaq up on a few copies of my favorite computer magazine.

### The Compaq Compact

None of my reservations about this computer were anywhere near major. The system worked, all of my software ran, it accepted all of the hardware we tried to plug into it, and it substantially survived several major treks as well as uncounted transfers from one desktop to another.

My knee and I will retain our reluctance to classify this as a true portable: It is portable in the same sense as a 19-inch television is "portable." (I will reserve awarding a certificate of full mobility to any computer until it fits in my briefcase.) However, I can easily imagine an accountant heading off for a week's assignment out of town with a Compaq; a writer could bring one along for a week's retreat in the

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**M**Y KNEE  
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woods; a company could invest in a set of Compaqs for temporary assignments around the office.

There is one other consideration: If you buy a Compaq, you are buying a machine that is missing three letters—I, B, and M. If that is not a problem, then it should be enough to know that this is a well-designed, well-manufactured and well-positioned microcomputer, certainly worth consideration by anyone seeking to run IBM PC software without an IBM PC.

/PC





# ARTIST

## Two High Performance Graphic Controllers for the IBM Personal Computer.

ARTIST transforms the IBM-PC into a graphics work station that would sell for over \$30,000. Tektronix 40XX emulation software allows the IBM-PC to interface with mainframe graphics software.

Output frequencies are adjustable for any monitor. ARTIST can drive the IBM monochrome display with 16 levels of intensity and 11 patterns of shading.

ARTIST has its own graphics library accessible from any programming language under PC-DOS or QUNIX. ARTIST also supports CP/M-GSX which provides communication to printers, plotters, and digitizers.

### FEATURES

- 16 colors
- 16:1 display zoom
- 16:1 character zoom
- Pan, scroll, paging
- Light pen
- DMA
- Mixed text and graphics
- Selectable character sets
- Solid & dotted lines
- 11 shading patterns
- RS343 output
- External genlock
- NEC 7220 processor
- Single expansion slot

### ARTIST 1 / \$3195

1024 x 1024 Industrial graphics  
170 x 96 Character display  
512K Memory  
16 - 40 MHz Bandwidth

### ARTIST 2 / \$1595

640 x 410 Business graphics  
80 x 50 Character display  
128K Memory  
16 MHz Bandwidth



**CONTROL SYSTEMS**

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CIRCLE 165 ON READER SERVICE CARD









# THE TRS-80 MODEL 100: NEVER AN IDLE MOMENT

*This elegantly-designed, briefcase-sized computer may not always be compatible with the PC but by-and-large, they get along famously.*

TRS-80 Model 100 Portable Computer  
Radio Shack  
Fort Worth, TX 76102

**List Price:** \$799 with 8K RAM; \$999 with 24K RAM. Upgrades of 8K (to maximum of 32K), \$119.95 each, plus installation. Batteries included. AC-adaptor and cassette cord optional.

CIRCLE 588 ON READER SERVICE CARD

**T**he TRS-80 Model 100 Portable Computer is not compatible with the IBM PC. Why, then, is it appearing in the pages of PC Magazine? Simply because this micro microcomputer is so well-equipped and practical that it makes direct disk-to-disk compatibility seem irrelevant.

Radio Shack's Model 100 offers a tool for business people, writers, and travelers straight out of the once-amazing days of





Dick Tracy and his wristwatch television set. The penlight-battery powered Model 100 allows you to take your office on board a plane or train or car, and then transmit or transfer your work to your comparatively-huge IBM PC.

It would not be easy to write an entire book using the Model 100, but you could readily work on a chapter while commuting to work or flying across country. There is not (at least yet) a way to develop a full-blown electronic spreadsheet analysis on the Model 100, but you would be able to load data and analyses from a larger computer. The 32K maximum storage/operations memory will not allow maintenance of a large database on board, but the built-in modem and communications software should make it very easy to use the Model 100 as a remote terminal.

### Smaller Than a Breadbox

Radio Shack's new computer is not much larger or heavier than the issue of *PC Magazine* in your hands. Yet it includes a full-stroke keyboard, an LCD display screen that shows, with proper lighting, eight lines of 40 upper- or lower-case characters. In a single line directly above the alphanumeric keyboard are eight programmable function keys, four preset command keys, four cursor-control buttons, and a built-in direct-connection modem.

The standard 32K ROM contains a full-featured version of Microsoft BASIC, a limited but usable word processor, a telecommunications package that can transfer files to or from other microcomputers and connect to networks such as CompuServe and the Dow Jones News Service, a clock/

calendar with time scheduler and appointment recorder, and a telephone directory and auto-dialer. Oh, yes—there's also an RS-232 serial port, a Centronics parallel-printer output, a port for a cassette recorder, a connection for a bar-code reader, a gateway to the central bus for applications yet unannounced, and a connector for plug-in ROMs.

That's an impressive array of standard features, but the most significant thing about the Model 100 is probably its battery-powered long-life memory. Forget disk drives: forget cassette recorders, and remember this: up to 32K RAM that can be maintained on board for weeks without a change of batteries or a recharge from an AC line. You could write more than 5,000 words—the equivalent of 20 double-spaced typed pages—and then make your way to the nearest telephone and transmit your copy to an IBM PC or other computer for storage, manipulation, or printing. You could take orders on the road, waiting for weeks until your return to the main office to download files. You could program a 32K BASIC- or assembly-language program, including dot-addressable graphics, a full range of ASCII characters, and several octaves of sounds, and then transfer the product to a larger machine.

### A Couple of Tiny Notes

Here are a few vital statistics: The Model 100 weighs in at 3 pounds 13.5 ounces and measures 8¼ by 11½ inches by 2 inches deep. (A piece of typing paper is 8½ by 11 inches.) It's actually hard to imagine a portable computer becoming much smaller without reducing the utility

of the keyboard and screen. The base price for a Model 100 with 8K RAM is \$799. A top-limit 32K unit would sell for \$1,119.

Power for the unit comes from four AA alkaline batteries or an optional 110-volt AC adapter. The on-board RAM is kept refreshed by a Ni-Cad battery pack that is recharged from the alkaline batteries or wall current. The alkalines are estimated to have a useful life of about 20 hours; a red light indicator on the front of the unit warns of low power.

The on/off switch on the side of the Model 100 controls only the power to the computer and screen. Power to the RAM is kept on at all times—Radio Shack says the Model 100 will maintain 32K RAM memory for about 8 days between power-ons. There is a well-protected central power switch on the bottom of the unit, designed to be turned off if the computer is to be deactivated for a long period of time and for replacement of the rechargeable Ni-Cad power pack about once every 30 months. Any copy not backed up on a cassette recorder or other device is lost when the master switch is opened.

The trick to the Model 100's battery operation is its dependence upon complementary metal-oxide semiconductor (CMOS) technology for its microprocessor, ROM, and RAM. These devices draw considerably less current than ordinary silicon chips. The liquid crystal display (LCD) also requires much less power than a video display or a light-emitting diode (LED) system. Further, the piezo speaker requires less power than an ordinary magnetic speaker. The computer will automatically shut down (saving files first) when activity stops for 10 minutes.

Under the hood of the Model 100 is a CMOS 8085 microprocessor (an 8-bit distant cousin to the 16-bit 8088 brain of the IBM PC), part of the Intel 8080 family of chips. The 8085 runs at 2.4 MHz. Radio Shack's 32K CMOS ROM packs a state-of-the-art sandwich of 32 8K-bit chips into a single integrated circuit. What's more, a compartment on the bottom of the computer has a 28-pin plug that will accommodate plug-in ROMs, possibly to add functions such as spreadsheets, full-featured word processing, specialized applications, and games. Next door is a 40-pin connector that is an extension of the computer's bus. It should not be long before Radio Shack (or other makers) offer peripherals to plug into the Model 100.



How about a video-display card to drive a monitor? A disk-drive adapter?

### Through an LCD, Darkly

The principal drawback to the Model 100 is its LCD display screen. The window can show 240 black dots across and 64 dots down, set against a blue-gray background. As owners of digital LCD watches know, though, it requires just the right amount and angle of light to make the numbers and characters visible—generally, a strong slightly-angled overhead light. The Model 100 includes a vernier adjustment on the side of the unit to brighten or darken the display, but you still won't be able to work in a dark room.

Characters are displayed in a 5 by 7 dot box, each standing about one-quarter inch high. The keyboard includes ordinary Escape and Control keys as well as Grph and Code buttons. The combination of the four special keyboard shifts and the ordinary alphanumeric keys allows direct access to all 256 ASCII characters included in the Model 100's repertoire. Although Radio Shack is not yet offering such a program, it should be easy for developers to come up with simple graphics programs and games for the Model 100, perhaps using the plug-in ROM compartment.

One other Shift key on the Model 100, called Num, converts ten characters on the right side of the keyboard into a calculator pad. I would have appreciated some tactile guide for these keys, such as a small raised dot on the I key, which subs for the number 5.

The eight function keys are clustered at the top left above the keyboard. From the center to the top right of the keyboard, there are eight special keys: Paste, Label, Print, Break/Pause, and four cursor con-

***IT SHOULD NOT  
be long before Radio  
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into the Model 100.***

trols. With the cursor keys, you can move the marker by character or line. You can also jump from the beginning of a file to the end by typing Ctrl and the down arrow, and from the left side of a line to the right side by typing Ctrl and right arrow.

Pressing the Label key from within any applications program displays the assignments of the function keys on the screen's eighth line, just above number indicators one through eight on the bottom border of the display window—a compromise that substitutes for having the function keys directly below the screen.

### Built-in Applications

When you turn on the power, the Model 100 displays the current date, day, and time, and an opening menu of five applications programs and as many as 18 RAM

files. The applications, loaded from the Microsoft ROM chip, are BASIC, TEXT, TELCOM, ADDRSS, and SCHEDL.

To enter directly into the text processor, you move the cursor to Text file and press the Enter key. The menu clears and the display asks for the name of the file to be edited. If you enter a name already stored, the computer will retrieve that file for editing and addition. If you enter an unfamiliar name, a file will be created. There is a second, very convenient way to enter the text editor for a file already in storage: From the opening menu simply move the cursor to that file's name and press Enter. The program will recognize the ".do" extension to the file name (added automatically by the text editor) and enter the appropriate programming into RAM along with the file.

Within the text editor, seven function keys have been specially assigned:

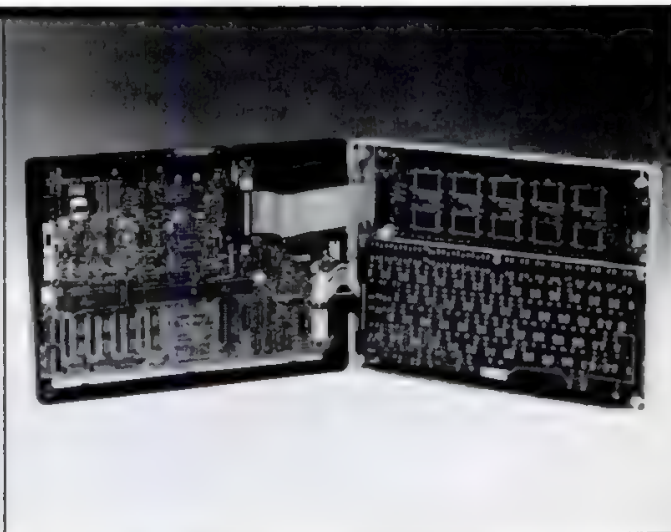
- F1 is Find, which allows you to search for a specified string (up to 24 characters long) in the text. The search ignores upper and lower case and looks only from the top of a file downward. It would be possible to manually perform a search-and-replace function by typing in a correction each time the characters are located in the file. F1 retains the current string characters until erased with a backspace key, so it is easy to step through a file quickly.

- F2 and F3 are Load and Save commands for storing files on a cassette recorder or other external device.

- F5, F6, and F7 are Copy, Cut, and Sel commands, part of the editor's block-and



Top view of TRS-Model 100.



Interior view of TRS-80 100.



word-manipulation functions.

● F8 exits the text program and returns to the main menu, saving the file to the battery-maintained RAM automatically.

### Using the Text Editor

The Model 100 text editor remains in an insert mode at all times. You can add copy at any point by moving the cursor to the desired point and typing. The text automatically reforms into paragraphs as copy is added or deleted. (Tell that to the designers of WordStar, someone.)

The Model 100 combines two types of deletion functions in its Del/Bksp key. In ordinary use it is an erasing backspace, removing the character to the left of the cursor and closing the gap it has opened. It, like all of the other keys, will automatically repeat when held down, and it is therefore possible to remove entire words or lines by merely holding the key down. When the Del/Bksp key is struck in combination with the Shift key, it will remove the character directly above the cursor and close the gap. Holding down this combination of keys will take out the remainder of a word or sentence to the right

of the cursor.

To manipulate whole blocks of copy, you first define the block by using the F7 Select key to identify the beginning and end. All of the copy selected is shown on the screen in reverse: gray against a black background. Once the copy has been defined, it can be deleted using the F6 Cut key; moved using the F6 Cut and the Paste key combination; or duplicated using the F5 Copy and the Paste keys.

This is the sum total of the text-editor program on the Model 100. Not exactly the bells and whistles of a WordStar, but for the purpose, adequate. A minor problem is that the program does not always line up the left margin of copy on the screen; when reforming a line, a space will sometimes hold at the end of the last word on the line above, which causes the space to appear at the beginning of the line below. A more serious drawback for word processing uses: Only eight lines of forty characters can be seen on the screen at any one time—one-sixth the display of the 24-by-80 IBM PC screen. (Some PC word processors may be a line or two shy of 24 because of status lines.)

```
Keefe, Janice J.:2075551212<=  
"C?U1234.567"MPPASSWORD"M>: 8088  
Chipwich Blvd., Silicon Mountain, MI.  
56502
```

Figure 1: Example of an ADRS.DO listing. Using the Address Organizer, you could search for any element of the data stored in the file. You could, for example, locate Ms. Keefe by asking the program to find her by name, area code, zip code, or any part of her address.

Printing a file from within the text editor is very simple. To dump the entire file to a printer driven by the built-in parallel port, merely type the Shift and Print key combination. To print just the lines appearing on the screen, you hit the Print button. The program will ask for a choice of width, with any number between 40 and 132 acceptable. Although not addressed in the manual, it should be possible to embed some Escape or Control characters in copy to allow underlining, bold-face, special characters (including graphics), and other special features of the printer. Similarly, a text-formatting pro-

## Love At First Byte?

*The truth must come out (as soon as the hackers disassemble the TRS-80 Model 100 ROM and figure out its file system).*

Once I saw a girl on a bus. She was a knockout. She gave a faint, demure smile in response to my admiring stare, then looked out the window. She must have felt my eyes on her the whole time, for when she got up to leave she flashed an incredible, devastating grin. I was in love. They say mystery makes romance. I knew absolutely nothing about her; maybe that's what did it.

That's how I feel about this new machine from Radio Shack. It's love at first sight, but there's still so much I don't know about it. I feel we have a great deal in common, but I hunger to know all. First, this package is superb, clearly better than the Epson HX-20, its chief competition. Despite Epson's built-in printer and microcassette, the features in the Model 100 are the ones you really need: the text editor, communications, the choice of parallel or serial ports, and the big beautiful display.

I have all these questions. There's an

8085 in there, but can I get at the machine language? The manual tantalizes me by talking about BASIC's ability to call machine-language subroutines and hints at a provision for a .CO (COMmand?) file

**T**HE RADIO SHACK  
Model 100 may give up  
its secrets grudgingly,  
but I mean to know  
everything.

type in addition to the .BA and .DO file types that cover BASIC programs and document files. There is a provision for uploading and downloading files through the modem and RS232 ports, but is there a

simple way to redirect the output from BASIC to the RS232 port instead of the Centronics port?

Who are Hayashi and Rick and Suzuki, and why are their names embedded in the ROM? What will be the function of the CRT and DSK input and output commands buried in BASIC's repertoire? I found that I could clear the screen with a formfeed (CHR\$(12)), but is there an escape sequence or other provision for direct cursor addressing? This may not seem like a burning question to you, but in addition to its duty as the ultimate PC accessory I'd like to use the Model 100 as a data terminal for a UNIX system. UNIX will respect all of the cursor-control and screen-management functions if you tell it what they are. Similarly, how do I access the reverse-video function?

Although Radio Shack is justifiably proud of its stacked-chip memory technology, it's a minor irritant to me. You can't buy a base-line machine and add



gram could be written to add headers, footers, and page numbering.

For this review, the Model 100 was used to drive two printers: A Gemini 10 dot matrix and the Smith-Corona TP-I daisy wheel. The Smith-Corona performed flawlessly, generating a professional-looking business letter from the Model 100 output. The Gemini required some adjustment of the DIP switches to add proper line feeds.

### Meeting the Schedule

The Schedule Organizer program is a mini-database to locate names, addresses, phone numbers, and other bits of information. The file is maintained in a special text file that must be named NOTE.DO. Three function keys are enabled under this program: F1 to "find" a particular item in the file and display it on the screen, F5 to find an item and send it to an attached printer, and F8 to save and exit the program to the main menu. The command keys, Paste, Label, Print, and Break, perform the same functions in all application programs.

NOTE.DO can be edited or updated

from within the text editor. One possible use for the program would be to maintain a running expense-account tally during a business trip. This is when the Model 100 is most likely to be used, anyway.

The Address Organizer performs a similar role, using identical commands and function keys in a file that must be named ADRS.DO (see Figure 1). Its purpose is to maintain a telephone directory that can be used for automatic dialing

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**T**HE SCHEDULE Organizer program is a mini-database to locate names, addresses, phone numbers, and other bits of information.

---

using the computer's built-in modem. Any string of numbers enclosed within colons signals the presence of a telephone

number to the program. Adding a <> combination after the number signals the telecommunications program to switch from entry to terminal mode after a link has been established. The program also allows you to add a log-on sequence between the angle brackets for use in establishing links to networks like CompuServe and The Source.

### Micro Telecommunicating

The Telecommunications Program (TELCOM) is divided into two modes: Entry and Terminal. The entry segment allows you to set the built-in direct-connection modem's communications parameters and the pulse-dialing of a telephone number entered from the keyboard or selected from the ADRS.DO file.

The Model 100 includes an answer/originate switch. The default communications settings for the internal modem are:

Baud rate: 300  
Word length: 7-bit  
Parity: Ignore  
Stop bit: 1  
Status: XON enabled  
Dial pulse rate: 10pps

your own (cheap) memory as you can with the TRS-80 Model 1. This is great for Radio Shack, bad for budget-minded consumers. They are also playing the technical details of the machine pretty close to the chest. Fortunately for the aftermarket, there are probably more down-and-dirty 8080/8085/Z80 hackers out there than there are for all the other chips put together. By the time you read this, one or more of them will have disassembled the entire ROM and figured out the file system and everything else inside. When this happens, you'll see a couple of "Secrets Revealed" paperbacks and maybe a user group or two spring up around the machine. Independent suppliers will provide hardware, software, and firmware enhancements. Competitors will move into the market and prices will fall. Machines with less than 32K RAM will disappear from view.

Is this machine a true breakthrough? Yes and no. It was built with off-the-shelf components with the exception of the stacked memory chips. Granted, the components are state-of-the-art, particularly the 40 column by 8 line display. Many of

the chips used inside are new on the market, given Radio Shack's desire to build the entire machine with CMOS chips. I guessed (and confirmed with sources at Radio Shack) that the reason the company used a CMOS version of the 8085 (80C85) instead of a CMOS Z80 is that currently, only one source produces a Z80, while several produce CMOS 8085s.

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**C**OMPETITORS will move into the market and prices will fall.

---

As impressed as I was with the Model 100's power, I couldn't help but feel that it could have been half as thick and half as heavy. To see why, take a look at the calculator industry. Inside the Model 100 are three fiberglass circuit boards: the main computer board, the keyboard, and a board that backs up the LCD display. If

weight and size were more important design criteria, all of them would be replaced by the paper-thin-flexible circuit board technology found in today's calculators and cameras. The Model 100 contains many analog circuits, and analog circuits mean resistors and other bulky components. These bulky elements could easily be replaced by thick-film custom circuits or custom hybrid analog and digital integrated circuits.

Although I am a strong advocate of full-travel keyboards, it is possible to build a machine like this with a membrane keyboard or a short-travel keyboard with tactile feedback and a hinge in the case. The keyboard could then fold over the display, and your portable computer would be the size of a Michelin Guide. As I write this, the machine I am describing is probably on someone's drawing board. If it isn't, the idea is free, get to work!

Unlike the seen-once and gone-forever girl on the bus, the Radio Shack Model 100 is here to stay. It may give up its secrets grudgingly, but I mean to know everything. Our relationship will be all the better for it.

—Bill Machrone



The program allows word length to be changed to 6 or 8 bits; parity to be set to odd, even, or none; stop bit reset as 2; XOFF enabled; and pulse rate doubled to 20pps. The baud rate for the built-in modem is fixed at 300 baud. However, there are nine other rates ranging from 75 baud to 19,200 baud that can be specified. Selecting one of these rates automatically shuts off the internal modem and activates the Model 100 RS-232C output port for connection to a stand-alone modem.

The telephone connecting cable provided with the Model 100 is designed to work with modular phone plugs. If these are not available in your home or office (or in a motel or telephone booth), Radio Shack sells a lightweight set of rubber cups that attach over the receiver and transmitter of a standard telephone handset to form an acoustic modem.

From the entry mode, typing the F1 function key allows you to Find a telephone number stored in the ADRS.DO file. To call the number, type F2. The name of the person being called and the phone number will appear on the screen as the Model 100 dials. The computer must next switch to the terminal mode, either automatically on the basis of the entry in the address listing, or manually, through use of the function key F4. Operations in the terminal mode depend upon the nature of the software at the other end of the line. For most programs, however, the function keys control uploading (transmission of files) and downloading (retrieval of files).

We tested the Model 100 by sending a file of several pages from the PC Magazine offices on one side of Manhattan to the automatic bulletin-board system of one of the editors on the other side of the island. The editor's IBM PC-XT successfully

successfully transmitted our file from the Model 100 and stored it in the PC-XT. Then, working on the IBM machine, we read the data as a nondocument file into WordStar and edited it. The only problem we experienced was that the Model 100 transmitted extraneous coding at the end of each line, and the WordStar file could not be automatically reformatted. It was necessary to remove manually the coding (WordStar's search-and-replace function would not solve the problem) and reform the paragraphs. However, other word processors might be able to handle the coding sent by the Model 100, or a simple program could be written to strip the file of bothersome signals. In any case, the transmission of information was successful.

Included in the package with the Model 100 is a password packet: a CompuServe manual with a password worth one hour of free off-peak time. A manual for the Dow Jones News Service is also packed in the box.

### A Bit of BASIC

The Microsoft BASIC offered by the Model 100 is almost identical to the IBM PC language (also developed by Microsoft), and as such, slightly different from TRS-80 BASIC used in other Radio Shack microcomputers. One thing very different—and to some users a great improvement—is a full program editor. Just type Edit from within BASIC and the screen clears and then displays a listing of your program within the text editor. You can move the cursor to any line to make changes or use the Search command to go to specific variables or values. The editor's Cut, Paste, and Copy commands are also available. Typing the F8 key exits the editor and re-enters BASIC with your corrected program already saved to RAM.

The LCD screen can be accessed on a pixel-by-pixel basis using Pset and Preset statements. Also within control are the RS-232C port, the function keys, the parallel-printer port, the bar code reader, the cassette port, and other devices. Additions to "ordinary" BASIC include interrupt instructions that can check the on-board clock, the communications port, and error conditions.

Model 100 BASIC also allows an override to the micro's automatic power shutdown after 10 minutes of inactivity. The ability to leave the power on would be necessary if you want to leave the Model

## **T**HE TELEPHONE *connecting cable provided with the Model 100 is designed to work with modular phone plugs.*

100 as an unattended answer-only terminal. Files can be merged, deleted, or renamed, but there is no provision for automatic line numbering or renumbering of lines.

### Stepping Up to the Bar

Radio Shack does not yet offer a bar code reader for the Model 100, although there is a port for such a device on the side of the unit. The plug is reportedly compatible with several existing wands. This capability could move the Model 100 into many exciting new areas. The Model 100 could go into the stock room or the laboratory for inventory and data collection. And, the Model 100 could read new programs for inexpensive bar code printouts, once again stepping around disk drives, ROM cartridges, and tapes.

One note, without comment: The Model 100 does not come from the American factories of the Tandy Corporation, Radio Shack's parent company. Instead, it is reportedly manufactured by Kyoto Ceramics Co. of Japan, a company responsible for an NEC portable introduced in Japan earlier this year.

### A Micro-Review

The Model 100 is an ingenious, capable device, truly worthy of the name microcomputer. It offers an exciting example of the new wave of portable computers. It would be even nicer were it based on the PC's 8088 microprocessor. Do I hear the sound of circuit boards etching somewhere?

Elsewhere in this issue is a review of the PC-compatible Compaq "portable" computer ("Compaq: Have Computer, Will Travel"). That device offers some very impressive capabilities, but consider this: On a recent trip, the Compaq sat sleeping up top in the luggage compartment while the Model 100 earned its keep on the seatback dinner tray. /PC

## **W**ITHIN THE *text editor, seven function keys have been specially assigned.*

answered the Model 100's call and established a link using Crosstalk software. It was possible to read a directory of the hard disk at the answering station, and we suc-



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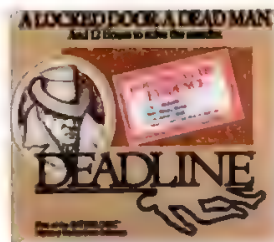
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**CIRCLE 602 ON READER SERVICE CARD**

BPS Business Graphics puts on a truly beautiful face. But like most beautiful people and objects, BPS is much more complex than a quick glance might indicate. This program is in effect a word processor

for business graphics: It will do it all, but it takes time to get beyond the basics.

BPS produces dozens of varieties of bar charts, pie charts, line graphs, and combinations. The output can be in mono-

Other Qume and NEC printers with protocols compatible with these choices.

IBM Matrix Printer with Epson Grafrax ROM, IBM Graphics Printer  
Centronics 122, 352, 353  
Epson MX80, MX80 Grafrax, MX100  
C. Itoh Prowriter 1550, 8510A

**Plotters supported:**

Houston Instruments  
DMP-3, DMP-4, DMP-6, DMP-7  
Hewlett Packard  
HP7225, HP7220, HP7221, HP7470  
IBM XY/750  
Sweet-P 100

**Letter-quality printers supported:**

Qume Sprint 5  
Diablo 630, 1610, 1620, 1630, 1640,  
1641, 1650  
Xerox 1710, 1720, 1730, 1740, 1741,  
1750

**Dot-Matrix printers supported:**

Anadex DP9000, DP9001, DP9500,  
DP9501  
NEC 3510, 3550

Watanabe WX4633, WX4634, WX4635,  
WX4636, WX4637, WX4638, WX4671,  
WX4672, WX4675

Amdek DXY-100  
Strobe

Integral Data Systems 440G, 445G,  
460G, 560G, PRISM

Okidata ML82A, ML83A, ML84A

*Figure 1: A list of printers and plotters supported by BPS.*

chrome or in multiple colors. The product can be viewed on a monochrome or color monitor or television. Hard copy printouts can be made on any of several dozen popular plotters, dot matrix printers, and let-



---

## **T**HERE IS no provision for operating BPS with a hard disk.

---

ter-quality printers (see Figure 1). You can perform mathematical calculations, and draw logarithmic, parabolic, sine, constant, or line curves. Your bar graphs can be horizontal or vertical, side-by-side or stacked, multi-colored or monochrome, filled or unfilled. You can set several lines of titles, add floating legends wherever you like, insert special marks, and label any element. You can even link together sets of pre-defined pictures in a timed "slide show." Get the picture?

### **The Bare Necessities**

The manufacturer recommends a PC system with a minimum of 128K of RAM and two double-sided 320K disk drives. It would be possible to run the program on two single-sided 160K drives with some loss of flexibility for choice of printers and plotters. There is no provision for operating BPS with a hard disk. Two disks are provided: one, a copy-protected UCSD Pascal program disk, and the second an unprotected demonstration data disk that

also contains several utilities.

The ultimate IBM PC system for BPS would include both a monochrome display adapter and monitor, and a color/graphics adapter and RGB monitor. With such a system, you could enter your commands and data on the monochrome screen and view graphs in color: the program automatically switches between the two adapters as needed. If you have only the color/graphics adapter, the text will be cleared from the screen but kept in memory when you call for the drawing of a graph. You can enter commands and data with a monochrome-only system, but the graphics output would have to be directed to a printer or plotter.

For this review, the program was tested on an IBM PC with 320K RAM, two double-sided disk drives, color/graphics and monochrome displays, a NEC 3550 letter-quality printer, a Hewlett Packard 7470 plotter, and an Epson MX-80 dot matrix printer with Grafrax.

The program manual is an impressive, padded 3-ring binder of about 420 pages. The page count is an estimate because some pages are not numbered, probably due to post-publication inserts of new output devices and features. Also included is a 17 by 22-inch wall reference chart of some of the commands of the program; to the uninitiated it looks like a map of the London Underground.

The manual itself is well-written and attractively designed, with plentiful ex-

amples of input and output. Unfortunately, the book falls down seriously in its organization. Concepts and commands are presented sequentially from the most simple to the most difficult. However, there is very little pulling together of structure in the advanced sections. When I wanted to draw a complex multiple bar graph, I had to refer back and forth from section to section to come up with the appropriate set of commands. The manual would be improved by recapitulations of principal commands for each type of graph. Some of these are available through

---

## **B**PS CAN do most anything you'd like to do in the area of graphics, provided you can figure out the proper sequence of commands.

---

an on-screen help system, but as delivered, BPS is a difficult program to learn.

### **Starting from Scratch**

Commands in the program follow the general form of Verb Modifier Noun Argument(s), as in Set Vertical Range 0 100.

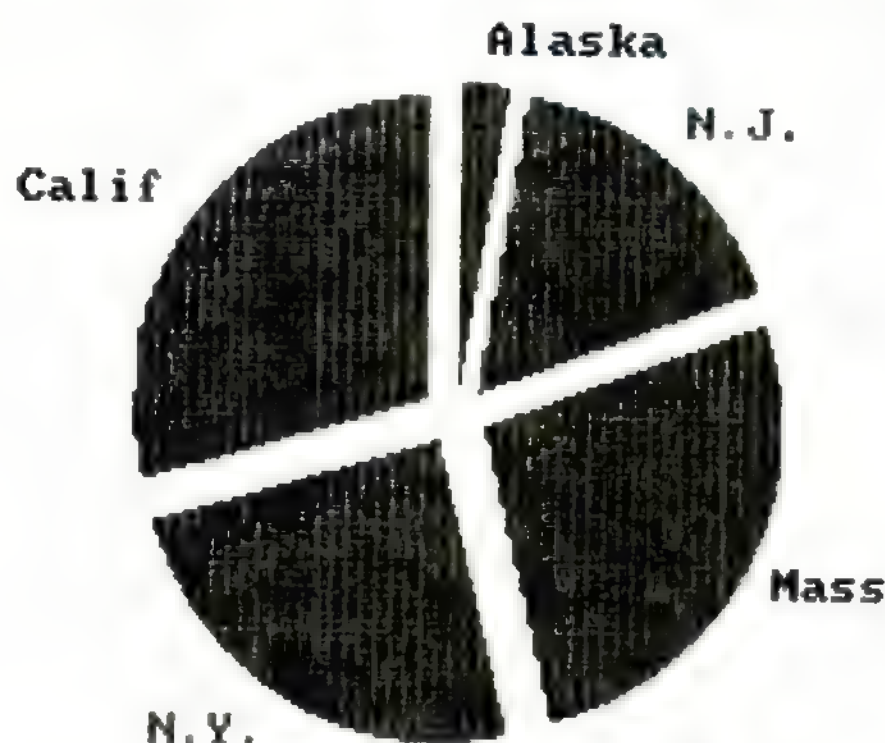


Figure 2: A simple pie chart drawn on an Epson MX-80 with Grafrax.

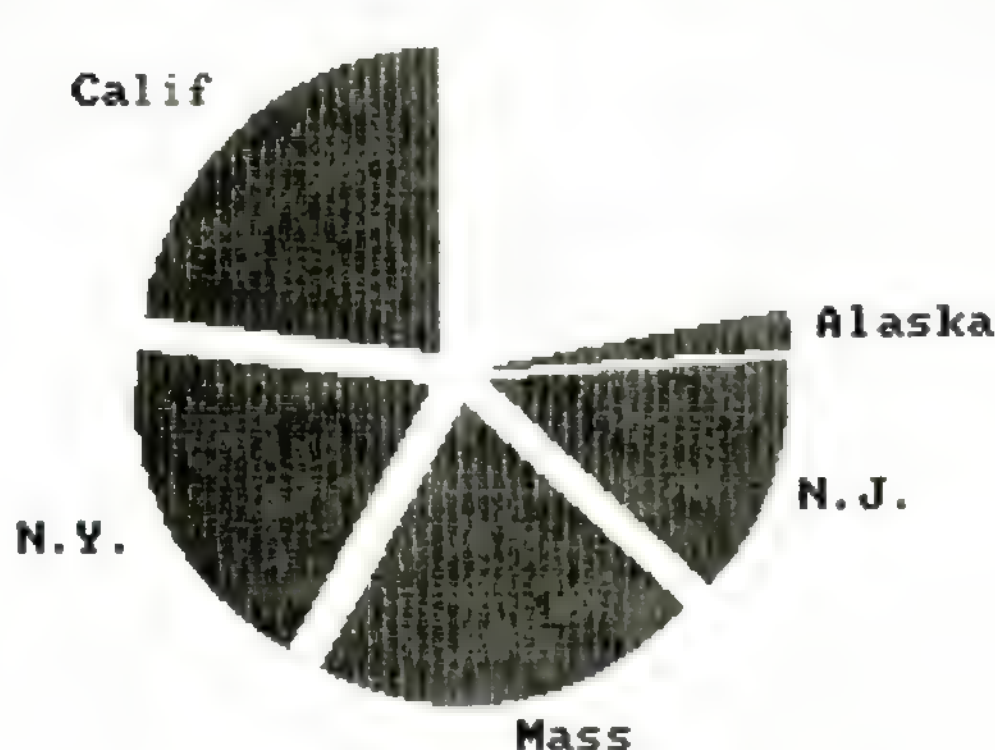


Figure 3: The same data, this time with the pie indicating a gap of 22 percent, drawn on an Epson dot matrix printer.



Many of the commands can be abbreviated; the program will alert you if you enter an abbreviation that is not unique. For

include plotters and some letter quality printers. "Write" devices produce graphics by transferring the bit-map in graphics memory from the console to paper. Dot matrix printers and some letter-quality printers fall into this category.

### Charting a Course

The graphics program resides in the A drive, while a p-System formatted data disk is installed in the B drive. A formatting utility is provided in the BPS package. The data disk is assumed to have the volume name of DATA unless the default is changed. The data disk can include several types of files: a listing of "points" of data for charts, a set of codes to reproduce a completed chart without specific reference to the points used in drawing it, and a "take" file. The take file is an equivalent of the PC-DOS AUTOEXEC.BAT file, and allows you to string together a set of commands. The take file can serve as a lifesaver from the complexity of BPS commands by allowing you to create—one time only—a series of shells of common functions that can be customized as needed.

I found that the sample data and take files included with the program provided a comparatively easy way to learn the system. Just as many users learn how to program in BASIC by reading a program listing, I finally began to understand BPS when I listed a few take files.

### A Slice of Sample Pie

Here are the commands, step by step,

for displaying a pie chart—perhaps the simplest of the available charts in this program—on a color monitor.

- SET DEVICE CONSOLE RGB 101 (Tells the program to send output to an RGB color monitor.)
- SET DEFAULT VOLUME PC TEST (Instructs the program to load or save from a data disk called PCTEST that will be loaded in drive B.)
- EDIT (Enters the editing mode.)

When you enter the Edit command, you enter labels and numbers in pairs separated by a space or a punctuation mark. For example, you could enter five pie segments as follows:

```
Calif 23
N.Y. 19
Mass 21
N.J. 13
Alaska 2
END
```

To draw an untitled pie chart from this information, all that would be needed would be the command DRAW PIE. The result, on the color monitor, would be a pie with five segments representing portions of the whole of 78. The colors would step through the three selections in our palette, in this case cyan, magenta, white, cyan, and magenta against a blue background. The name of each slice would be printed outside of the pie segments. See Figure 2 for an example of this pie chart drawn on an Epson MX-80 dot matrix printer with Grafrax.

Suppose that you wanted to add one

## AS DELIVERED, BPS is a difficult program to learn.

example, SE VE RA 0 100 is an acceptable short form.

When you load BPS you enter into a blank screen with a ---> prompt. The computer knows nothing about your plans for use of a display, a printer or plotter. Depending upon the type of monitor you are using (the manual calls them "consoles"), you can choose one of three modes: high-resolution black and white, low-resolution black and white, and color. The color mode can further be subdivided into RGB or TV outputs. The command can be refined another step by selecting a foreground palette (green-red-yellow or cyan-magenta-white) and one of 16 background colors. For example, to select a background color of blue with the foreground color set of cyan, magenta, and white, the command would be:

SET DEVICE CONSOLE COLOR 101

A "set" device in BPS is an output unit that directly executes graphics. In addition to monitors, "output unit" can

### PC Owners

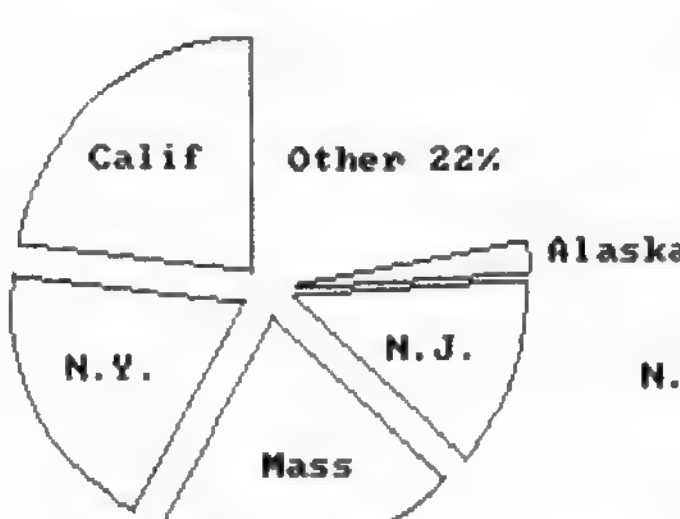
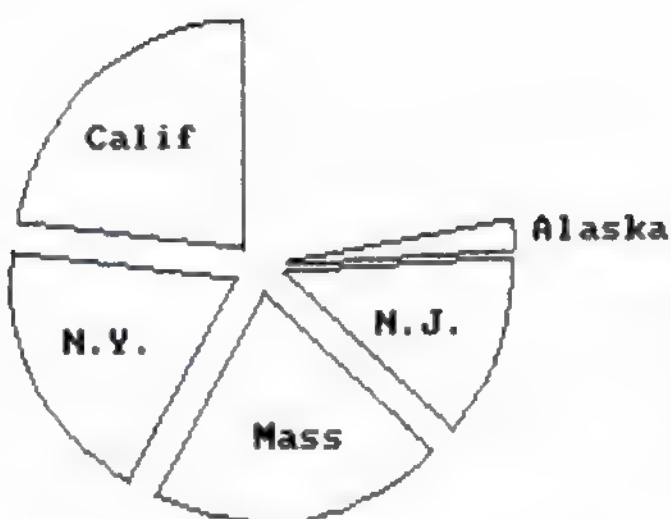


Figure 5: In this chart, the floating title, "Other 22%" has been added, along with a general title.

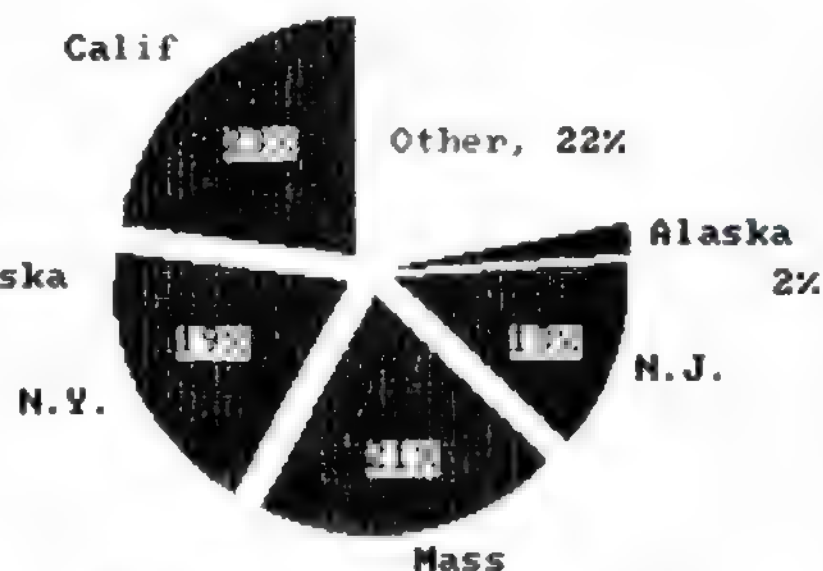


Figure 6: Switching back to FILL ON, this version of the same chart includes floating percentage figures set into pie wedges (except for the Alaska slice, which is too narrow to accept the percentage figure).



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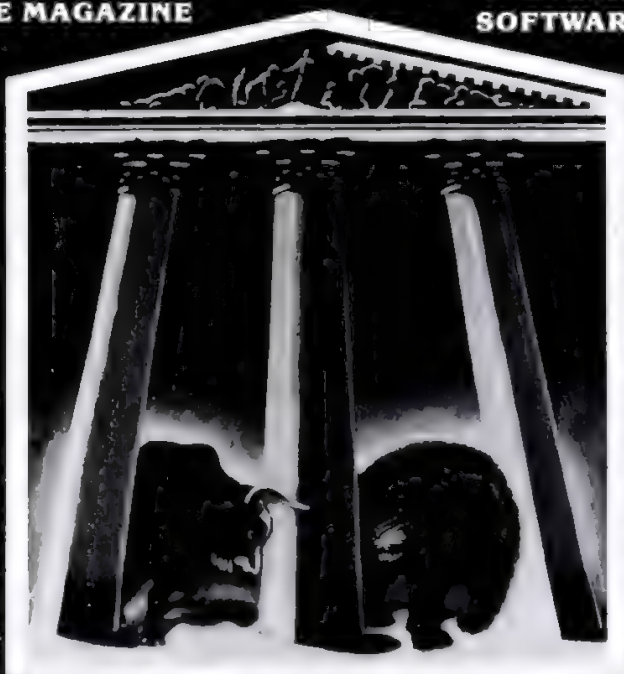
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## Elements of PC-DOS

## PC-DOS Utilization

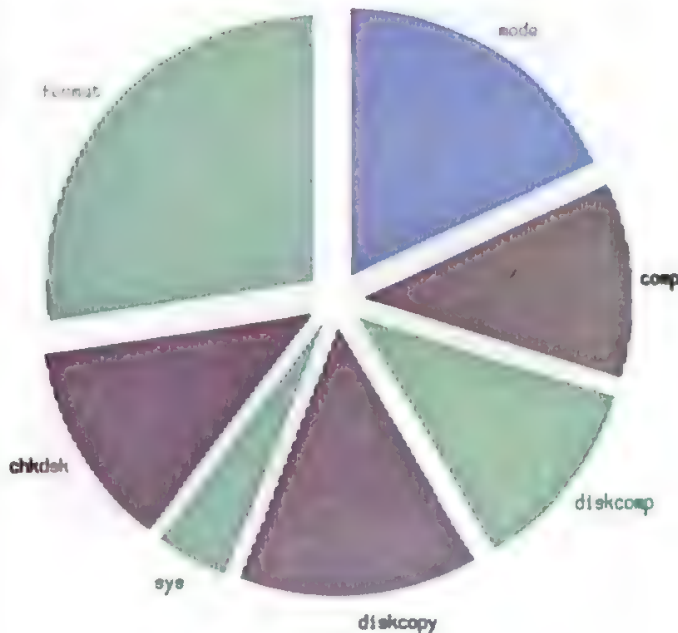


Figure 7: A three-color filled pie chart produced by the BPS program on a Hewlett Packard 7470A plotter.



Figure 8: The same pie chart, this time plotted with the Fill option turned off.

more slice representing the rest of the states. The correct command is `DRAW PIE 0 100`. This tells the program to scale the pie to represent 100 percent of the total (see Figure 3). The program will proceed to generate a sixth wedge, representing the required 22 percent.

Another command, `SET FILL OFF` results in pie segments that are outlined but unfilled. When you select this option, the program automatically inserts the names of variables inside the pie segments (see Figure 4). `SET FILL ON` returns to the default condition.

### Adding Titles to the Pie

BPS allows addition of titles to the top and bottom of most charts, to the horizontal and vertical axes of bar and line graphs, and anywhere else on a chart through use of a "floating title." `SET TITLE "PC OWNERS"` will put a general title at the top of the pie. The floating title command is `SET HORIZONTAL FLOATING TITLE "Other 22%"`. When you call for a floating title (horizontal or vertical), a rectangular box of the same length as your title appears in the center of the screen. You can then

position this box where you want the title to appear—in this case, in the unfilled pie segment—by using the cursor arrow keys and then striking Return when the box is in the proper place (see Figure 5).

If you draw the pie with Fill turned on,

you will generate solid slices of pie with the names of states set outside the circle. To insert a percentage inside the pie, you instruct the program to set percentage titles in the background color, in this case blue: `SET COLOR BACKGROUND`. Next,

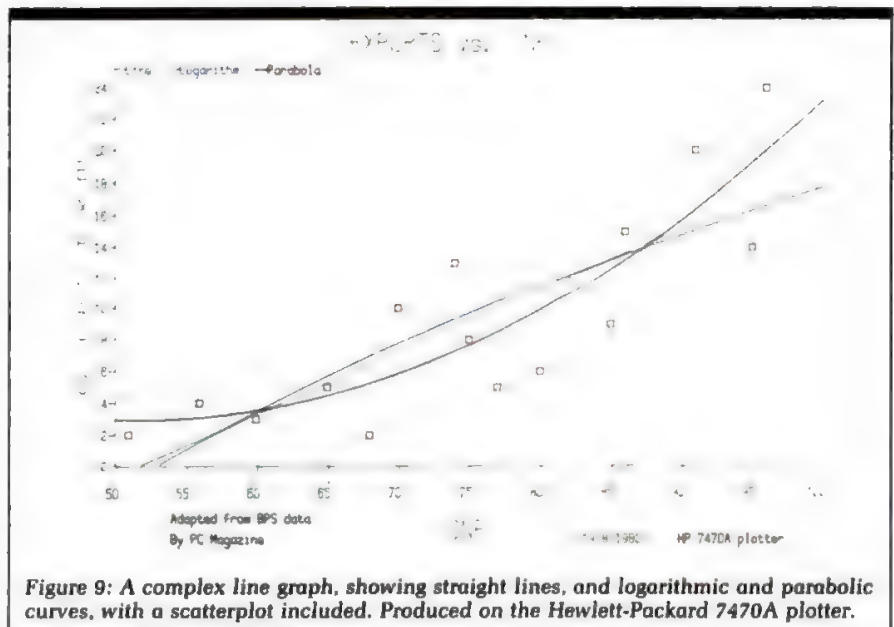


Figure 9: A complex line graph, showing straight lines, and logarithmic and parabolic curves, with a scatterplot included. Produced on the Hewlett-Packard 7470A plotter.



you call for and position these percentage figures for four (in this case) of the five pie slices. The wedge for Alaska is too narrow to permit insertion of a percentage figure within the slice (see Figure 6). The pie chart completed, you can save the work in the form of points or a completed graph.

### Drawing the Line

Here is an example of a more complex line graph, displaying both an ordinary point-to-point line and a smooth moving average line. Using an Edit command, data for each of 31 days of a month—the example is August—are entered, as in:

```
1 425
2 401
3 475
4 424
X
X
X
30 641
31 697
END
```

The titles are created:

```
SET TITLE 'CAR AND DISK DRIVER
MAGAZINE'
SET HORIZONTAL TITLE 'August,
1983'
SET VERTICAL TITLE 'Subscrip-
tions sold'
```

Since we are going to be drawing a line chart with two lines, it would help to be able to identify which line is which. We can do this with a "legend." We must instruct the program to set aside space for two such legends:

```
SET LEGEND SPACE 2.
```

Now we are ready to draw the first line, using the simple command DRAW LINE. If we follow this immediately with the command, SET LEGEND TITLE "L = ACTUAL" 1 the program will draw, in the same color used for the line, a legend that indicates that a solid line (L) stands for ACTUAL subscriptions received.

Next we want to show a line that depicts the subscription sales trend, a "smooth moving average." The program will smooth out the jagged up and down points of the data. The general form of that command is SMOOTH MOVING AVERAGE <past points> <future points>. What you are being called upon to provide is a range over which to determine the average (arithmetic mean) of the data.

For example, SMOOTH MOVING AVERAGE 3 2 would instruct the program to

## BEER PRODUCTION 1980

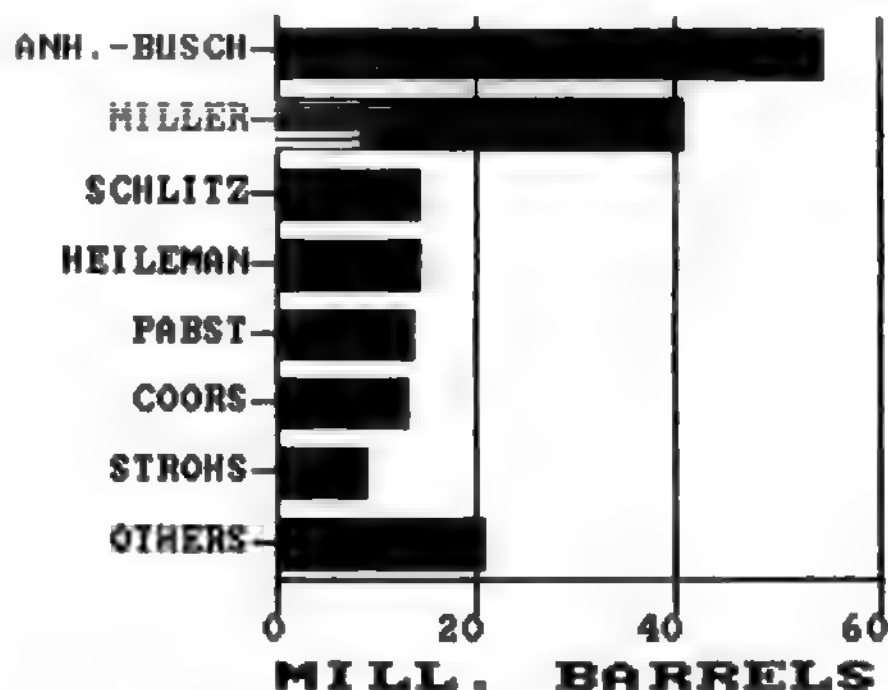


Figure 10: A not-very-successful example of a BPS bar chart produced on a NEC 3550 letter quality daisy wheel printer. The art is made up on thousands of individual dots punched by the printer in a process that can take more than 10 minutes for a single chart.

take the first five data points and compute the average. It would then assign that average to the first point listed as the <future points> argument, in this case, the fourth data point. Next, the program would average the next five data points and assign that value to the fifth point, and so on. The computations continue until the program can no longer find five points to average. (An alternate form of the smooth moving average is the smooth exponential line, in which the averages are more heavily weighted toward the recent past.)

In order to differentiate this smooth moving average from the ordinary line, we instruct the program to DRAW DASH. The dash is one of five styles of lines that can be drawn using the BPS program.

Finally, we call on the program to SET LEGEND TITLE "D = MOVING AVERAGE" 2. This places, in legend space 2, an indication that the dashed line represents an average.

### Now, the Hard Work

All of this work has been reproduced on a color RGB monitor. In order to make a hard copy printout of any of the charts, it is necessary to configure the program to your hardware. BPS includes about a dozen protocols among the utilities on the data disk, covering most common devices. The manual includes step-by-step instructions for configuring other devices, including information on setting DIP switches on printers and plotters if necessary.

There are two steps to output. First, you must inform the program that output will no longer go to the console. The form for this instruction is SET OUTPUT UNIT REMOUT for "remote output," the required command for activating the serial (asynchronous) port used by plotters and some printers. For transmission of information via the parallel port, the command is SET OUTPUT UNIT PRINTER.

The next step is to identify to the program the specific unit to be used, as in SET DEVICE HP7470 0 2, telling the program to use handshaking (0), and two different pens with a Hewlett Packard HP7470 plotter. Using a "write" device such as the Epson MX80 requires the command WRITE SCREEN MX80GRAFTRAX.

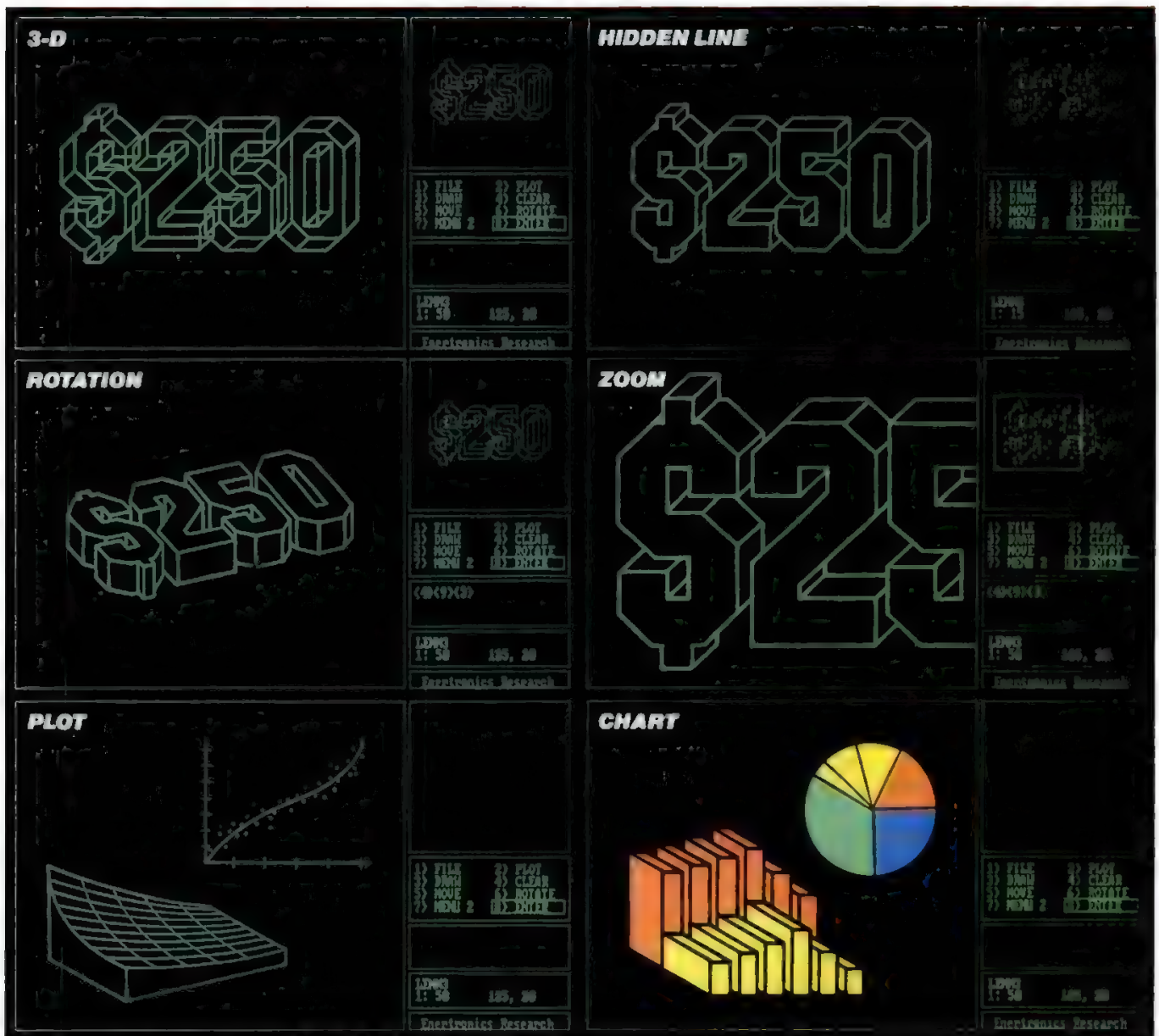
### What Does It All Mean?

If all of this sounds confusing, it's because it is confusing. BPS can do most anything you'd like to do in the area of graphics (see Figures 7 through 10), provided you can figure out the proper sequence of commands. I kept thinking of my first few sessions with a word processor: I learned to use that, too, after days of gnashed teeth and strained eyes.

Don't look at this program if all you want to do is make pretty pie charts. That would be like buying an ocean liner for cruises on the mill pond. But if your needs are complex, this complex and capable program is for you. /PC



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This review will describe three drawing programs for the IBM PC: *Glyphix* from Starside Engineering, *PCcrayon* from PCsoftware, and *PC-Draw* from Micrografx. These three programs vary in price from \$24.95 to \$250. They are, however, similar in concept and performance. They all can cater to the needs of groups of users as diverse as draftsmen, businessmen, designers, and doodlers.

The concept behind these drawing pro-

grams is simple: they replace the drafting table and drawing tools with a video screen and computer keyboard. The arrow keys move the cursor like the tip of a pencil; the backspace key becomes an eraser. The system's RAM holds the equivalent of the templates, the T-square, and triangles. You move the cursor around the screen with the arrow keys or with commands specifying screen coordinates. The program draws a line wherever you designate a point. Each of the programs has certain built-in shapes that can be called up from the command menus and manipulated as desired. The number and kinds of shapes and the degree of manipulation vary among the programs.

The real advantage of these programs is their ability to produce versions of an initial drawing with major or minor changes and to keep all of the versions ready for fast reproduction. This ability allows you to easily update engineering drawings, produce various drawings from "what-if?" analysis, and rapidly modify and generate corporate organization charts. If you are going to make a drawing only once, it will probably be easier and faster to do it with a pencil and paper, but if you expect to make a revision with even one change, the computerized drawing system will save you time.

The two programs that use color displays—*Glyphix* and *PCcrayon*—are lim-



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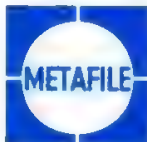
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ited to the color palettes used by the IBM color-graphics adapter. The adapter offers two different palettes of three colors each. This setup provides little flexibility. When you change to the other palette, you immediately change the colors of all of the figures on the screen, so certain pairs of colors (such as green and cyan, red and magenta, and brown and white) cannot be on the screen at the same time.

Your choice of color palette will depend on the background color you use (15 are available), the work you are doing, and the color response of your monitor (for example, many monitors do a poor job of reproducing brown). Both Glyphix and PCcrayon allow you to change the palette and background colors with a single key-stroke for each operation.

### Glyphix

The name Glyphix is derived from the term "glyphs," meaning the figures used in hieroglyphic scripts. The choice of this name sets the tone for the program and its manual. Glyphix is a useful and some-

## Product Information

*The following programs are mentioned in this article.*

*Please contact the manufacturers for additional information.*

**Glyphix and Frieze**  
 Starside Engineering  
 P.O. Box 18306  
 Rochester, NY 14618  
 (716) 461-1027

**List Price:** Glyphix \$24.95, Frieze \$55  
**Requires:** 64K, BASICA, color/graphics adapter, color or non-IBM monochrome monitor.

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### PCcrayon

4155 Cleveland Ave.  
 San Diego, CA 92103  
 (619) 279-2482

**List Price:** \$44.95

**Requires:** 64K, BASICA, color/graphics adapter, color or non-IBM monochrome monitor.

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### PC-Draw

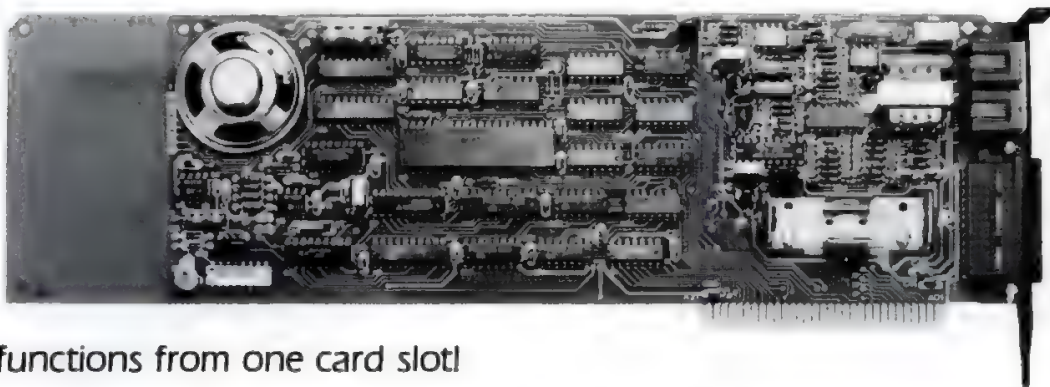
Micrografx  
 8526 Vista View Drive  
 Dallas, TX 75243  
 (214) 343-4338

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**Requires:** 128K, two disk drives, color/graphics adapter, non-IBM monochrome monitor, (light pen optional).

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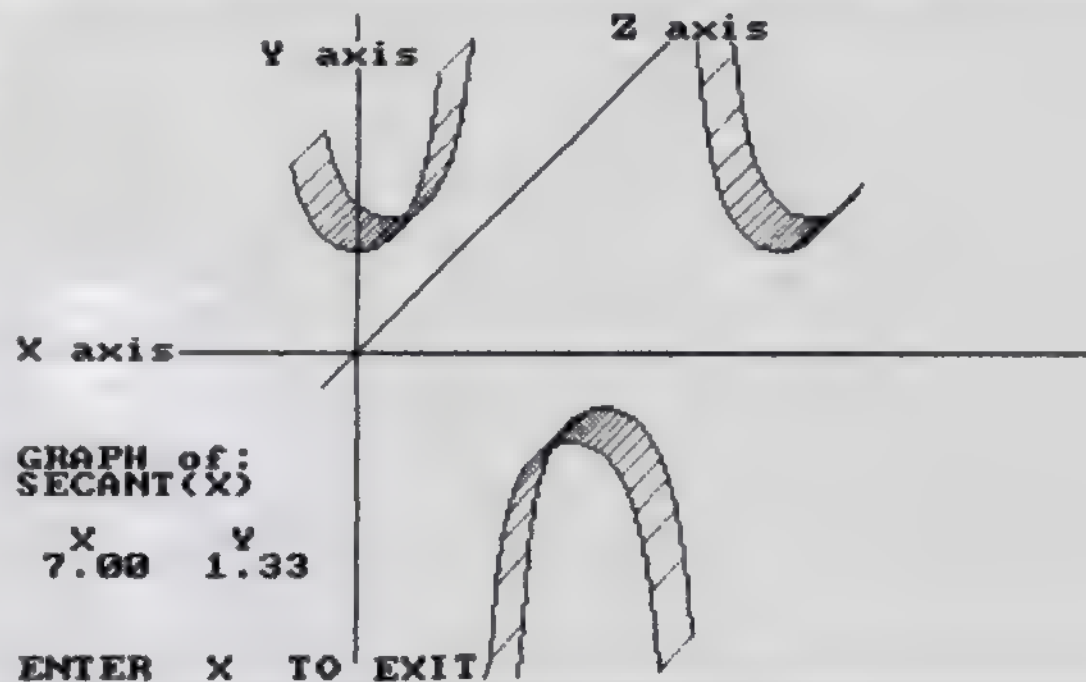
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Figure 1: These curves were created by Glyphix using a BASICA program. The resulting screens were saved as disk files, then were printed on an IDS Prism color printer using the Frieze program.



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**THE CONCEPT**  
*behind these drawing programs is simple: they replace the drafting table and drawing tools with a video screen and computer keyboard.*

times even playful graphics scratchpad. It can be used for serious image creation as well as for sketching and doodling. The best news is that Glyphix sells for \$24.95. You'd need a separate \$55 program called Frieze to print out what Glyphix creates, but, with only the relatively inexpensive Glyphix package on hand, you can create, display, and save diagrams.

Glyphix provides you with a clean screen to draw on. At the start, a single pixel flashes off and on in the upper left corner. You can move it around the screen by pressing the cursor positioning keys on the keypad. The 4, 8, 6, and 2 keys, labeled with arrows as well, move the cursor left, up, right, and down; the 1, 7, 9, and 3 keys move the cursor diagonally. Moving in these eight directions creates lines with the same angles used in isometric projection drawings. I had a great deal of fun trying to create diagrams with top view, right side, and isometric projections—the kinds of drawings that used to frustrate me so when I was in high school. I didn't miss my T-square and triangles a bit—I found



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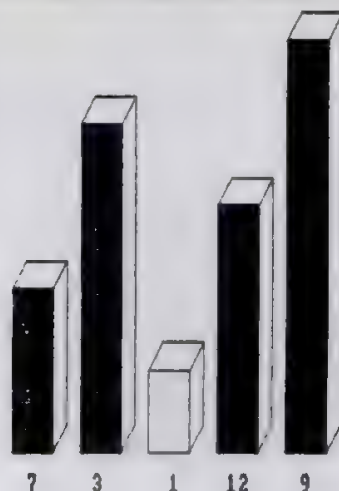


Figure 2: This complete dump of a Glyphix screen includes the command line and a bar chart constructed with graphics characters and lettered titles. In the command line, the "Segment Size" area shows the number of pixels (from 1 to 50) the cursor travels on each movement. "At" shows the cursor location. "Travel" indicates the state of the cursor; it is not drawing a line or printing. "Undo" is a special Glyphix feature (here turned off) that saves the screen image to disk before executing a major command. This feature allows you to undo any changes by calling the old image back in. The "Pal" and "Colr" items select one of the two pallets and one of that pallet's three colors provided by the PC's color graphics board.

### TEST FOR MINIMUM READING LEVEL IN NYC SECONDARY SCHOOLS

Minimum Level of Competence —

Schools in Test Sample 14



Seg Size: 5 | At: 23,25 | Travel | Undo: Off | Pal: Odd | Colr: 3 | Fill

**I**F YOU ARE going to make a drawing only once, it will probably be easier and faster to do it with a pencil and paper.

the job much easier.

When you start using Glyphix, the cursor is programmed to move one pixel at a time. This mode allows very precise drawings, but it slows the progress of the cursor across the screen. You can press the Z key followed by a number from 1 to 50 to increase the number of pixels used in each move. You can also move the cursor quickly by using the G command followed by the coordinates of the position to which you want the cursor to go.

Glyphix has the ability to automatically make certain geometric shapes in a choice of sizes. If you press the E key and follow it with parameters describing the size and angles in the shape, the program will automatically draw circles, arcs, and pie segments. This Glyphix command actually allows you to access the Circle command in BASICA. The program contains standard parameters that it passes to the interpreter if you don't override them. These parameters include the radius, color, start, end, and aspect of the figure to be drawn. Aspect is the ratio of height to width of the figure; i.e., if you give 3 as the aspect, an ellipse drawn by Glyphix will

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Figure 3: A screen dump from Glyphix demonstration disk.



be three times as tall as it is wide. This measurement is approximate because the figures are formed of pixels and a pixel is considerably higher than it is wide.

It takes some patience to draw good circles and arcs with the E command. If the program's default values are not used, you must designate the new parameters carefully in order to avoid an illegal entry. Since the program provides no visual prompts, both new and experienced users must rely heavily on the manual.

One of the simpler Glyphix commands is B, for box; this creates a box of a certain

size at a specified location. Two keystrokes are needed to define the opposite corners of the box you wish to draw. The third and final keystroke tells the program if the box should be filled in (you type F) or drawn in outline (you type CR).

**I**<sub>T</sub> IS  
difficult to use Glyphix  
without referring  
constantly to the  
manual, but the  
program does contain  
some clever audio  
prompts.

Once a figure is on the screen, Glyphix allows you to lift it and store it in a shape table. The shape tables you create in RAM can be stored on the disk. Afterwards, you can duplicate the shape as many times as you like on the screen. You can pull the shape in any direction using the eight cursor keys; then you can tack it down by entering a carriage return. The program provides a table of shapes that includes the logic symbols commonly used on a standard flow chart.

Glyphix also provides for easy entry of text, so drawings can be clearly labeled. You can pull each letter around the screen until it's positioned when you press the next letter key.

It is difficult to use Glyphix without referring constantly to the manual, but the program does contain some clever audio prompts. I, at least, think they are clever. Other people find them frustrating and irritating. The author of Glyphix, Jeff Duntmann, has included the following audible clues to the operation of the system. When you make a legal keystroke, the speaker sounds a pleasant little tone. An illegal entry brings the electronic equivalent of a Bronx cheer. When the program puts a box on the screen, it plays its own little "box song." Commands that might result in the loss of data, such as clear screen, are met with a little five-tone song that seems to say, "Are you really sure?" If



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## A New Deal for PC-Draw

*An updated version of PC-Draw should be more convenient to use than the original.*

Micrografx has announced an enhanced version of PC-Draw that will increase its ease of use, user friendliness, and functionality. The upgrade, version 1.1, is being supplied free of charge to present users of version 1.0.

Version 1.1 increases the number of functions selectable by a light pen; this device can support all menu selections, most Alt combination key functions, cur-

sor control, as well as circle and freehand line drawings.

The new version provides an alternate text function to facilitate user selection of text symbols. The text template includes two text fonts.

PC-Draw 1.1 offers many new functional capabilities. You can change drawings or templates without exiting a drawing session, create circles via a function

key, draw diagonally in the pixel-draw mode, select and manipulate block symbols, fill in symbols, and rotate print sideways. It also allows horizontal paging, and full-width condensed print (two pages printed side by side).

The program's over all performance has also been enhanced. Drawing and template files now use approximately half as much disk space as version 1.0. PC-Draw 1.1 still is priced at \$250. —F.J.D.

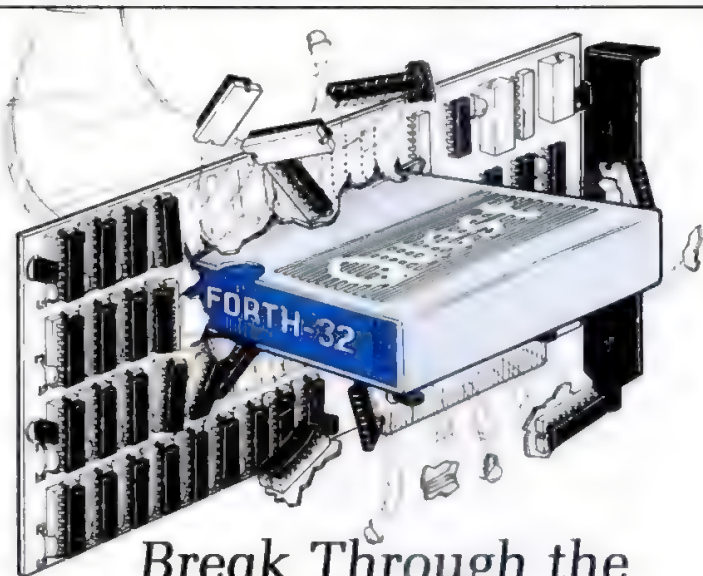
## AN ILLEGAL entry brings the electronic equivalent of a Bronx cheer.

you are really sure, the program responds with two tones that sound like "OK!", then executes the command. I liked the audio very much, but if you are the type who expects a program to sit there and do your bidding quietly, the audio can be turned off with a single command.

Glyphix is an unprotected BASIC program. It can be listed and modified, and it is full of comments so that you know what the various program segments do. You can change the program to suit your needs.

The Frieze printing program, available separately, is needed to transfer the drawings created with Glyphix to a printer. Frieze can also be used to save complete screens created with Glyphix. Up to nine screens can be quickly recalled from the keyboard. A simple BASIC program can be used with Frieze to bring in up to 256 different screens. This has obvious uses, such as preparing a "slide show" with the PC for a business presentation.

Frieze is written in 8086 assembly language. It can be stored in RAM along with the Glyphix program and BASICA. You start the program by pressing the PrtSc key while in the graphics mode. Frieze will dump drawings to any Epson MX-series printer equipped with Grafrax; the IBM PC printer; IDS 450/560 with the G option;



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# A SIMPLE BASIC program can be used with Frieze to bring in up to 256 different screens.

for screen dumps in color; the IDS Prism and Prism Color printers can be used. See Figure 1 and Figure 2 for examples of

Glyphix printouts.

Glyphix is a capable and economical program that makes the creation of graphic drawings easy. But, remember, there are other competing software packages.

## PCcrayon

PCcrayon has many of the capabilities of Glyphix. The approach of the program is the same in that it provides a higher-level command language to interface with the BASICA graphics functions. PCcrayon does not provide the clever audio clues that come from Glyphix. Also, I found the

Glyphix documentation to be much easier to use and much more readable. The Glyphix manual contains many helpful hints and even suggestions of mnemonic phrases to help you remember the commands. The manual for PCcrayon seems to have been written by someone locked into a large mainframe-computer mind-set. One clear indication is the instruction to IPL the DOS system. Aside from being redundant, this expression is a candidate to win the mainframe-mentality award in the terminology class. The documentation also sends you to the IBM BASIC reference manual to explain relatively-simple concepts such as the color palettes.

PCcrayon can perform the same kinds of cursor movements as Glyphix—it even uses the same cursor keys. Both direct movement and cursor-controlled movement is possible.

PCcrayon makes a distinction between the way it stores figures and the way it stores lines. Figures are referred to as graphics symbols. Any figure can be saved in a file by defining the corners of the figure. Vector symbols are lines that can be any size, angle, or color; these can be used to create letters or special symbols.

This program is unique in that it can make a recording or "scenario" of the series of steps used to create a display. A scenario is captured in PCcrayon if you use the Z-CAPON command before you begin your drawing. As you create the drawing, the program records every step.

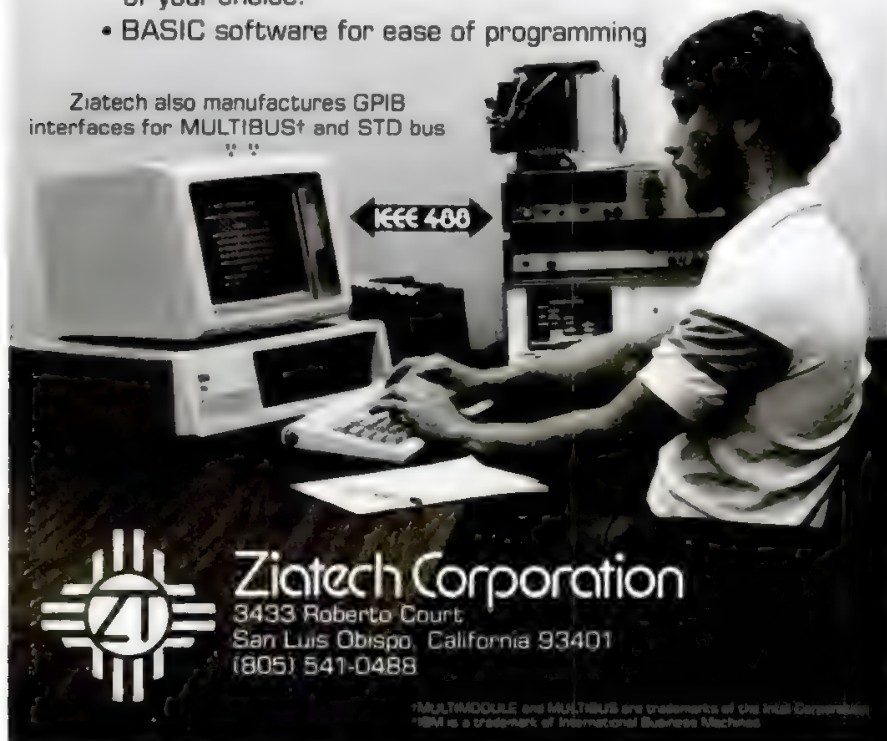
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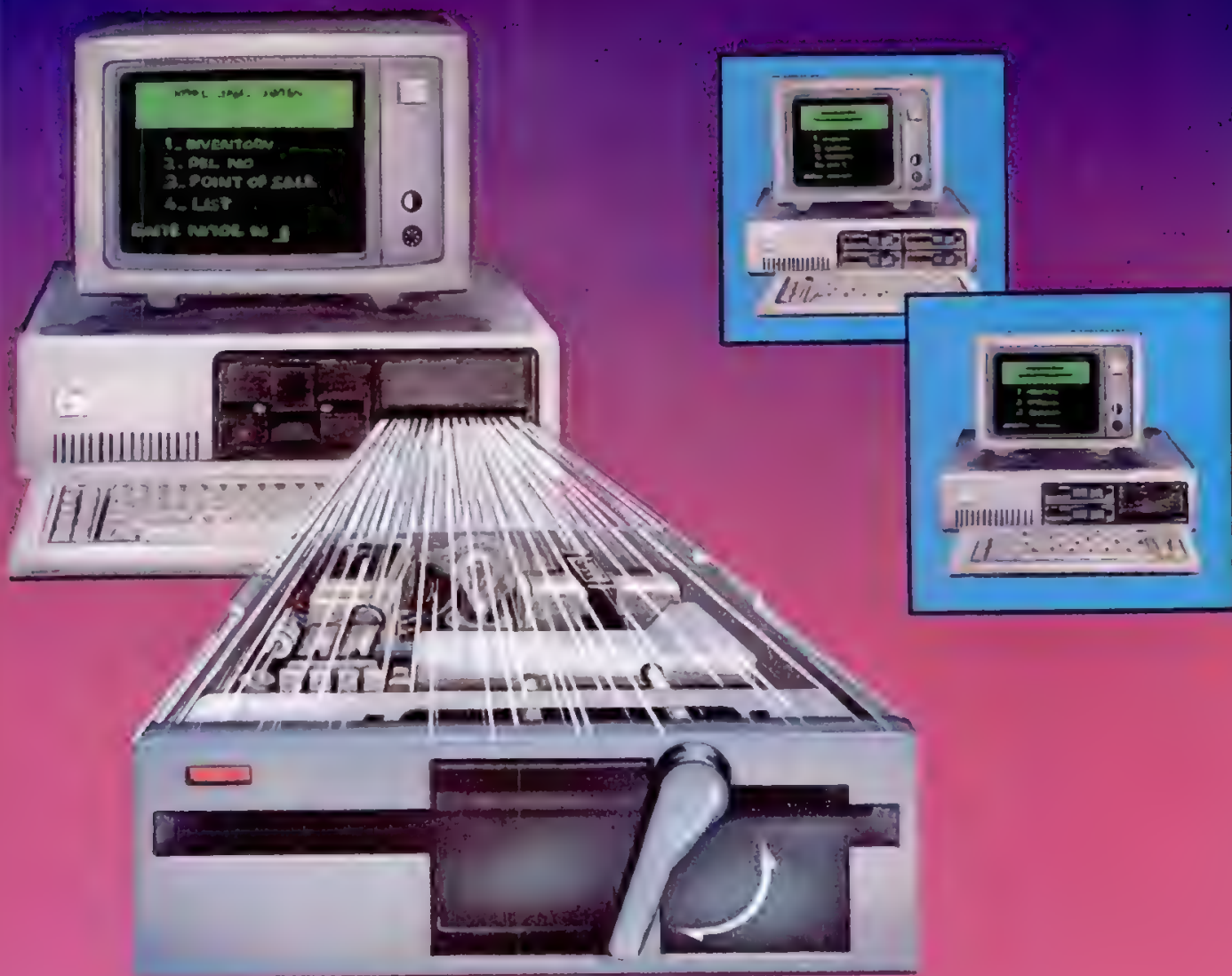
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**T**HE MANUAL  
for PCcrayon seems to  
have been written by  
someone locked into a  
large mainframe-  
computer mind-set.

When you want to repeat the drawing, you can replay the scenario from memory; the program will recreate the screen from the original sequence of stored commands.

An alternate method of saving a drawing is to make a bit-for-bit copy of the 16K memory area on the color/graphics board. Using the scenario, however, takes much





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less disk space. A scenario can be edited or corrected, though this isn't a simple job; it is easier to save a complete drawing with a bit dump. The scenario option however, can provide you with a way of transferring graphic files out a modem port

as an ASCII stream.

PCcrayon has a Float command that allows you to move a symbol across the screen slowly. If this command is used in a scenario that includes erasing and clearing all or parts of the screen, the result can

be an animated presentation that is played by the PC. When I tried to create this kind of animated presentation, I found I needed to work from a detailed prepared script. This approach was much easier than the cut-and-try-and-edit method.

# PCcrayon

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Figure 4: A screen dump from PCcrayon demonstration disk showing features of the program.

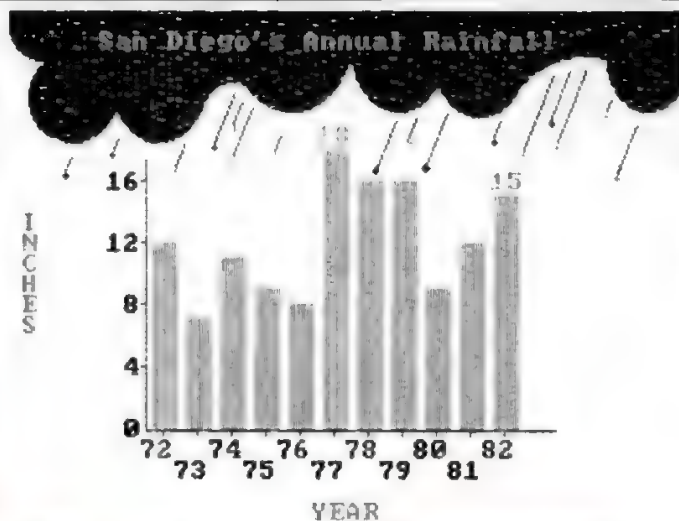
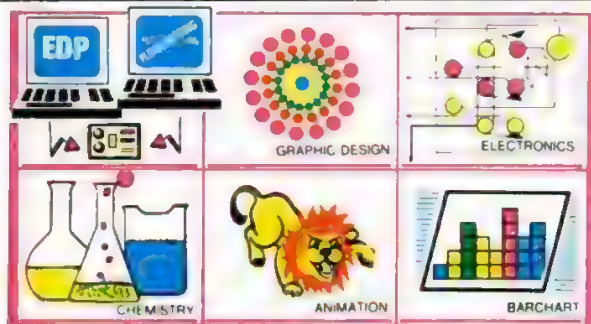


Figure 5: A screen dump from PCcrayon illustrating features of the program.



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## PC-Draw

One appealing feature of PC-Draw is the provision of two templates of drawing symbols. One template contains software flowcharting symbols (see Figure 6), and the other holds symbols used in electrical schematics and logic diagrams (see Figure 7). One of these symbols can be selected from the template with the cursor or with a lightpen; then it can be reproduced at any point on the screen. The symbols can

**Figure 6: The two templates provided by PC-Draw. On the left, the Software Flowcharting Template; on the right, the Logic and Electrical Design Template. You can modify these templates and create others.**

1	PC-DRAW	1
		
		
		
		
		
		
		

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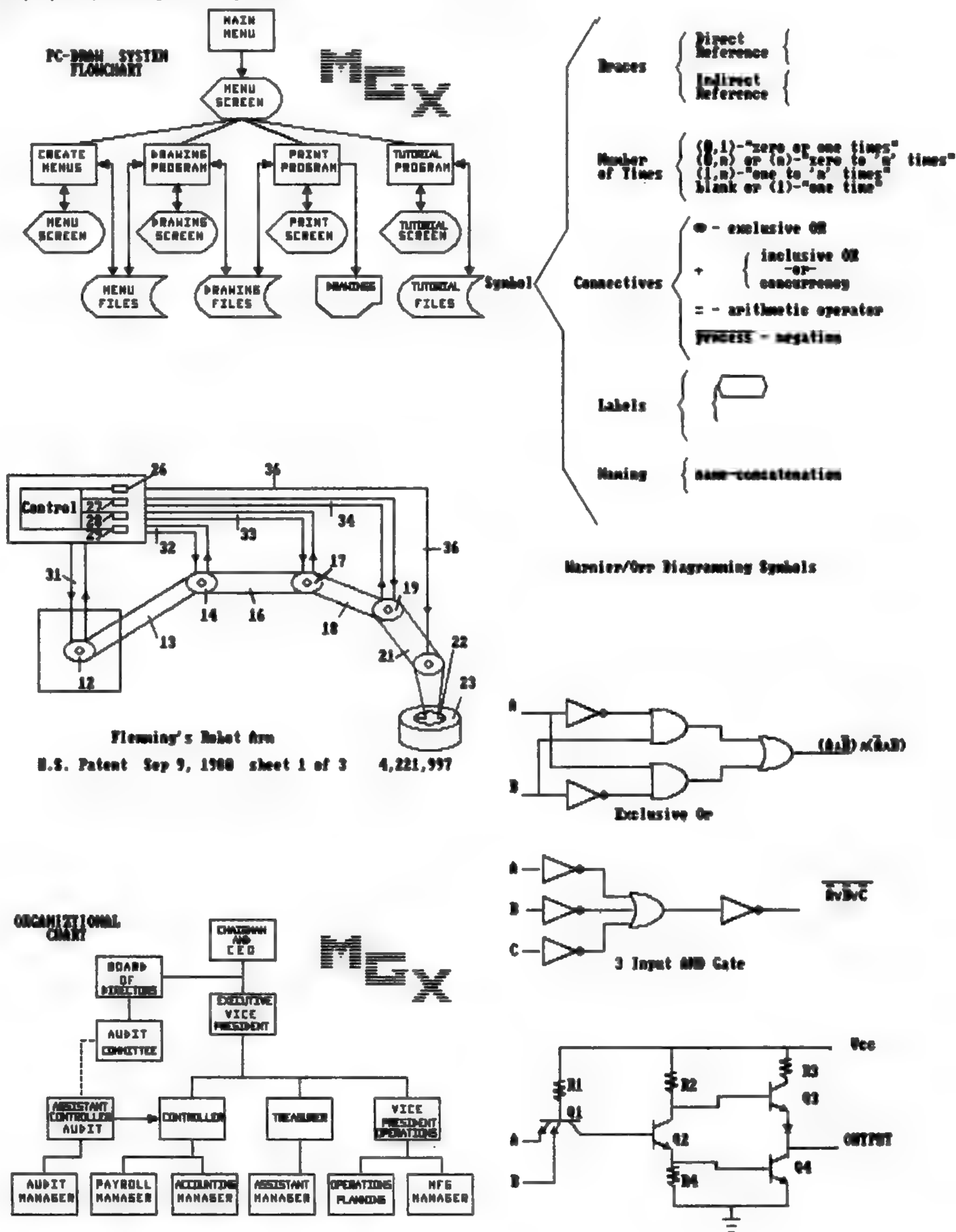
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Figure 7: A variety of drawings made with Micrografx's PC-Draw, illustrating the program's capability of combining template symbols and freehand drawing to create many styles of drawings and diagrams.





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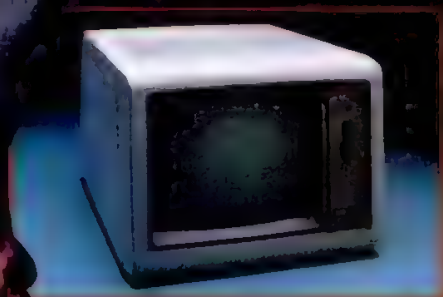
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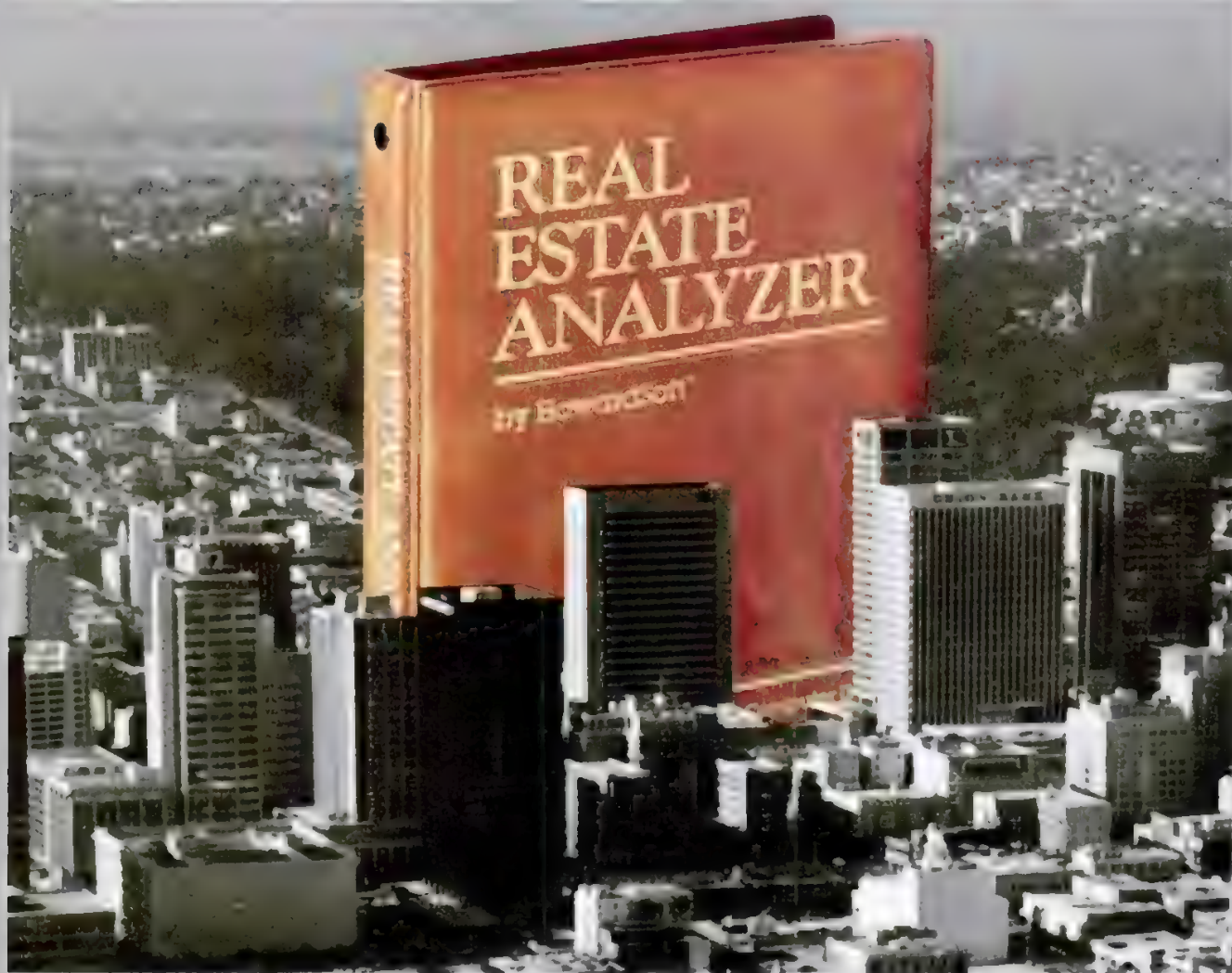
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be rotated in 90-degree steps and expanded or contracted in size with simple key-stroke commands. You can modify the two existing templates and make your own templates to meet your needs.

You can also draw angled lines by ordering the program to connect any two points on the screen. I have not yet, however, figured out how to erase an angled line once it is drawn. I made several such lines by mistake and suffered great frustration trying to erase them cleanly.

PC-Draw makes good use of the PC's special function keys and key commands. Rotation, expansion, contraction, and many other figure-manipulation commands are controlled with the special-function keys.

Drawings created with PC-Draw can be paged just like pages of text in a word processor program. This gives you the ability to make extra-large drawings, such as schematics and logic charts, that can run for several pages.

PC-Draw is oriented toward providing high-quality hard copies of the drawings

you make. Two standard-size print formats are available. The standard and emphasized printing modes put two

***R***OTATION,  
expansion, contraction,  
and many other figure-  
manipulation  
commands are  
controlled with the  
special-function keys.

screen images on a single printed page. Each printed image is almost exactly the same size as the screen image. An emphasized print mode makes the print about twice as dark as in the standard mode.

Another feature is condensed printing. Three condensed formats are available,

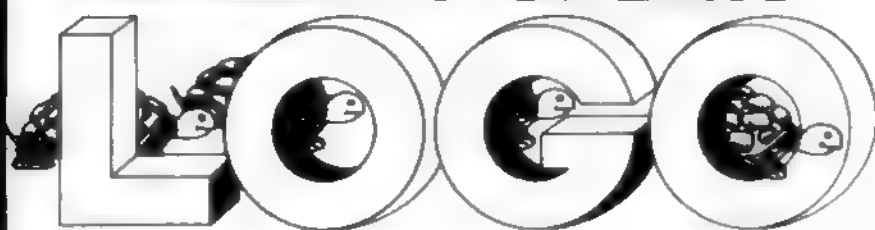
which are identical in appearance except for the place they occupy on the printed page. Using these condensed formats will reduce the size of the drawings by 50 percent so that four screen images will fit on a single page. This gives you the ability to work comfortably with large scale drawings on the screen, and then reduce them for reproduction.

The manipulation powers of PC-Draw are great and it is particularly fun to use with a light pen. See Figure 7 for printouts of diagrams created with this program. At \$250, PC-Draw is not inexpensive, but it will certainly appeal to users with serious drafting requirements.

### Draw Your Own Conclusion

These programs for the PC range from the businesslike to the sublime. They can help you use your PC more effectively at home and in business. They take advantage of the significant graphics capability provided by IBM, giving you another means of harnessing your computer's power for useful and creative work. /PC

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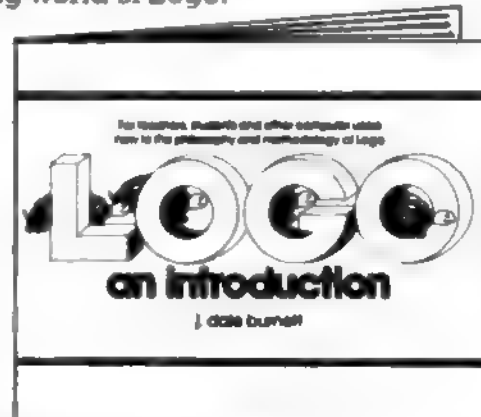
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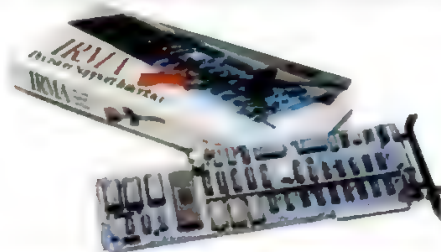
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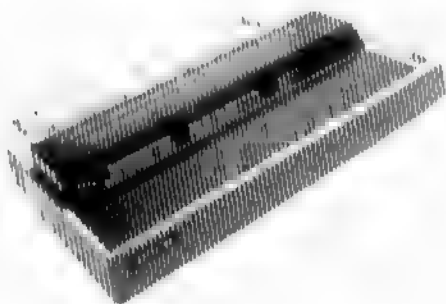
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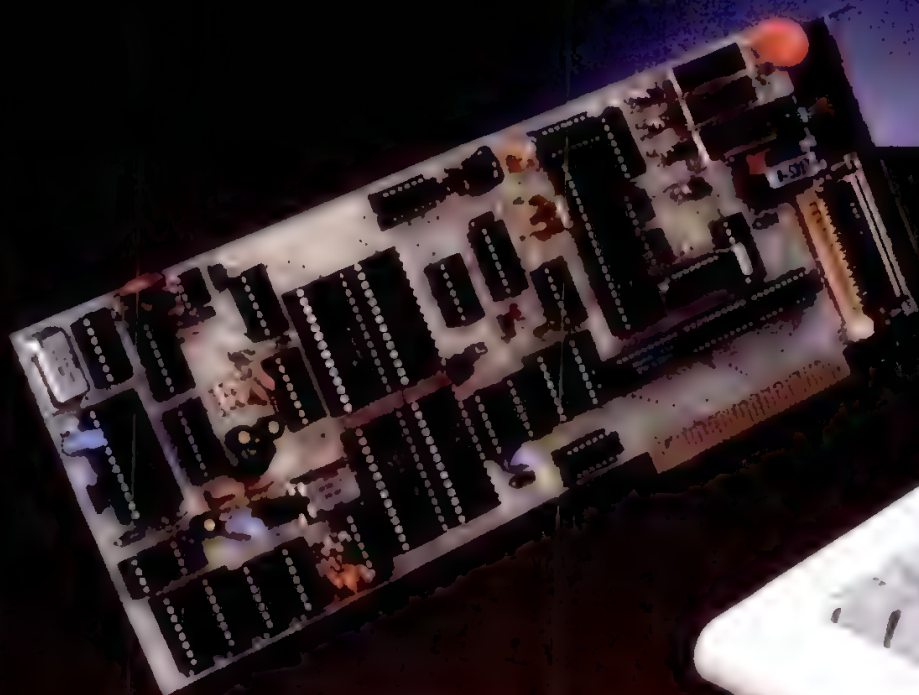


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**CIRCLE 426 ON READER SERVICE CARD**





*Color may be all the rage, but before you rush out to buy a rainbow for your PC, take a look at what lurks behind the screen.*

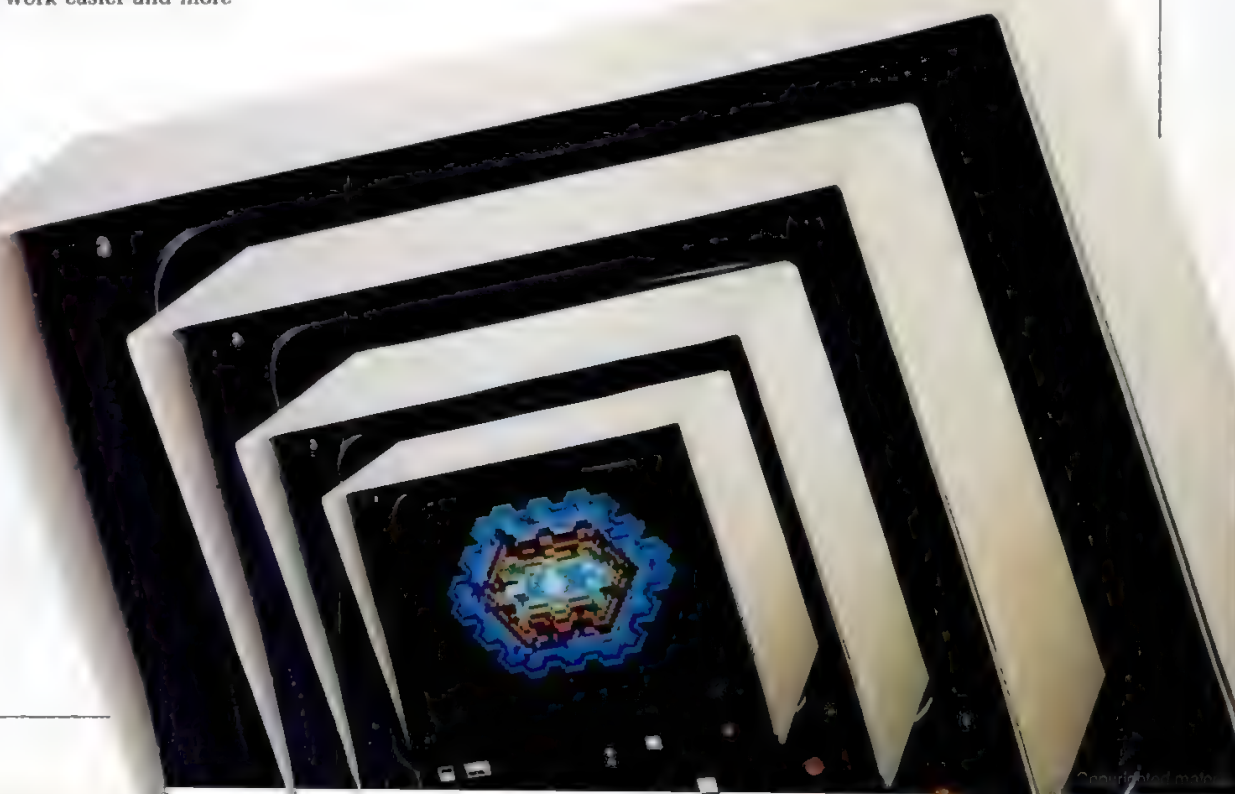
# HIGH-RESOLUTION COLOR MONITORS

**T**o some PC people, color monitors are for playing games. To others, they are status symbols, expensive luxuries to round out their personal computer systems. But if your IBM PC is more than a toy or decorative accessory, a high-resolution color monitor can multiply the value of your system as well as make your work easier and more understandable.

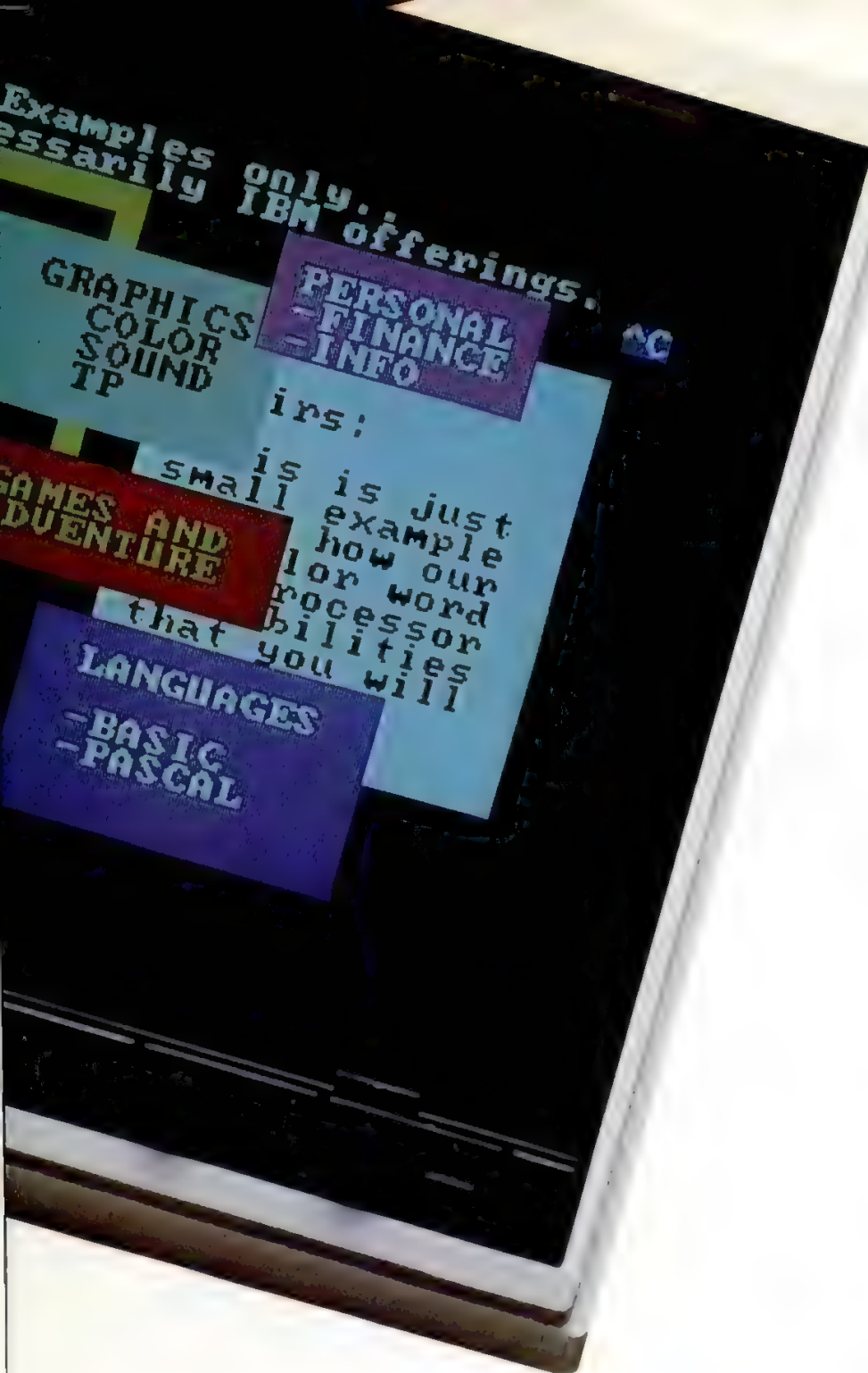
Beyond this, high-resolution color monitors linked with the IBM PC are pointing the way for the next generation of personal computing. One look at recently released hardware, such as the PC-XT and IBM color monitor, should convince you that the future belongs to color. The latest software packages rely heavily on graph-

ics and color capabilities.

The IBM PC itself was designed to take advantage of advanced color capabilities, and, when combined with a suitable color graphics expansion board, is adept at handling multi-hued screens. Taking full







should display its labors in color to communicate with its human operator.

### The Video Alternative

The link between the PC and your mind is the monitor. Because a monitor bears a superficial resemblance to a televi-

**A HIGH-resolution color monitor can multiply the value of your system and make your work easier and more understandable.**

sion set, the two are often confused. In fact, a television set adapted with a "modulator" can be used as a monitor for the PC; the resulting image is workable, but hardly satisfying.

A color television often doubles as a low budget monitor because nearly every living room already has one. Just about as often, the on-screen picture is disappointing because television sets, by design and construction, can't handle the exacting detail required by a computer system.

Computer monitors are, in fact, a separate breed from the television, even though both share many parts and have the same ultimate goal: visual communication. These differences become most apparent when the goal is to communicate in color. A high-resolution red-green-blue (RGB) monitor can reproduce more detail with greater control than any television can ever aspire to. Color monitors are so named because red, green, and blue are the primary colors of light.

Although color televisions are essentially interchangeable and share common standards (so that they can receive standard broadcast signals), color monitors need not be aimed so specifically. While most people judge color televisions only by their cost and picture quality, color monitors for computers are distinguished by lengthy lists of specifications replete with terms like "resolution," "persistence," and "type of input."

When you decide to go beyond the

advantage of all PC capabilities requires a high-resolution color monitor.

Adding a color monitor can benefit a small system. Color adds excitement and realism to computer games. In business, where everything is reduced to a bottom line that is seen only in black and red, color monitors can help isolate data, identify trends, and track production flow.

The varied hues on the color monitor screen clarify and help to separate elements of the display. New software packages, seeking to mimic the traditional

desk-top workspace with "windows" that correspond to many sheets of paper, use a different color for each imaginary piece of paper in order to identify it.

A color monitor conveys ideas and impressions faster than black-and-white (or black-and-green) words. And not only does color speed recognition—consider the common traffic light—but it also conveys emotion and feeling.

Color is so much a part of our lives that most of us dream and think in color. It's only natural that a thinking machine



minimal quality of a plain color television as a monitor for your PC, you must match these specifications to your needs and the capabilities of your computer. You should know what all the terms and specifications mean. To do this, you need to understand how both monitors and television sets work, and how they differ.

### RF, Composite Video and RGB

The major difference between a monitor and a television set is the type of input signal used. Different video displays, whether color monitors or televisions, use different signals to produce pictures. The three most common signals are radio frequency (RF), composite video, and RGB.

RF is the same kind of signal used for television broadcasts through the airwaves. Most television sets have RF inputs called "antenna terminals."

The IBM PC does not directly produce an RF signal that can be fed to a television set. To use a television, the PC requires a modulator, which acts as a small television station and changes the signals created inside the systems unit into RF, usually on channel 3 or channel 4.

Most color monitors use either composite video or RGB input signals. Composite video refers to a television signal before it is broadcast. The composite signal combines all the brightness, color, and synchronizing information necessary for operating a monitor or television set into a

nal produces a reasonably high-resolution picture, the color parts do not.

The system isn't good enough to reproduce high-resolution graphics on computer monitors. Thus, most computers that connect to television sets have their display widths limited to 40 characters.

The strict limitations that made NTSC necessary need not apply to personal computer systems. Remember, the goal of NTSC was to put all necessary picture information into a single television channel for broadcasting (RF) or onto a single wire inside the studio (composite video). This combining process robs NTSC signals of their detail, a limitation that becomes more apparent for computer-

related applications.

The good news is that the combining process is not necessary in a computer system. Rather than combining the signals of each primary color, RGB interconnections use separate wires for each color channel. Because the system is self-contained, it's possible to run a few extra conductors for individual color channels inside an interconnecting cable. The cable runs only a few feet between the systems unit and the color monitor.

**T**ELEVISION sets are unable to handle the exacting detail required by a computer system.

form that can be transmitted through a single wire or communication channel.

In the United States, all color television stations and most video equipment use signals that meet the National Television Standards Committee (NTSC) standard. Because a single standard is used, all of these television signals are compatible. Unfortunately, the NTSC standard limits the quality of television signals. Although the black-and-white part of the NTSC sig-





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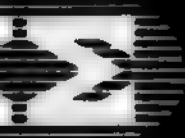
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<b>Amdek</b> 2201 Lively Blvd Elk Grove Village, IL 60007 (312) 364-1180 circle 587 on reader service card	Color II	13 inches	560 x 240	Transistor- Transistor Logic (TTL)	7 + intensity	9	.43	no	yes	<b>\$700</b>
<b>Amtron</b> Box 1150 Aptos, CA 95003 (408) 688-4445 circle 586 on reader service card	1308	12 inches	850 x 640	Analog/TTL	Analog: infinite TTL: 8	50	.31	yes	yes, with Amtron color card	<b>\$1500</b>
	1909	19 inches	1280 x 1024	Analog/TTL	Analog: infinite TTL: 8	50	.31	yes	yes, with Amtron color card	<b>\$3500</b>
<b>Aydin Controls</b> 414 Commerce Drive Fort Washington, PA 19034 (215) 542-7800 circle 585 on reader service card	8810	13 inches	greater than 3000 characters, greater than 600 pixels per line	Analog/TTL	Analog: infinite TTL: 16	25	.31	yes	yes	<b>\$1000</b>
	8830	19 inches	greater than 4000 characters, greater than 700 pixels per line	Analog/TTL	Analog: infinite TTL: 16	25	.31	yes	yes	<b>\$1000</b>
<b>Electrohome</b> 809 Wellington St. North Kitchener, Ontario CANADA (519) 744-7111 circle 584 on reader service card	1301	13 inches	720 x 512	Analog	Analog: infinite With interface: 16	25	.31	yes	yes, with Electrohome interface	<b>\$1700</b>
	1302-2	13 inches	580 x 235	Analog	Analog: infinite With interface: 16	10	.43	no	yes, with Electrohome interface	<b>\$729</b>
<b>Hitachi Sales Corp. of America</b> 401 West Artesia Blvd Compton, CA 90220 (213) 547-8183 circle 583 on reader service card	CM 1472	13 inches	560 x 240	TTL	16	12	.43	no	yes	<b>\$725</b>
<b>IBM</b> For authorized dealer call (800) 447-4700 circle 582 on reader service card	IBM PC Color Display	12½ inches	addressability up to 640 x 200	TTL	16	not available	.43	yes	yes	<b>\$680</b>
<b>NEC Home Electronics</b> 1401 Estes Avenue Elk Grove Village, IL 60007 (312) 228-5900 circle 581 on reader service card	JC1203DH	12 inches	690 x 230	TTL	16	8	.31	no	yes, with CG- 91 cable	<b>\$895</b>
<b>Princeton Graphic Systems</b> 1101 E. State Rd Princeton, NJ 08540 circle 580 on reader service card	HX12	12 inches	690 x 240	TTL	16	15	.31	no	yes	<b>\$695</b> (includes cable)
<b>Quadram</b> 4357 Park Drive Norcross, GA 30093 (404) 924-6666 circle 579 on reader service card	Quadchrome	12 inches	690 x 480	TTL	16	18	.31	no	yes	<b>\$795</b>
<b>Sony Consumer Products Company</b> Sony Drive Park Ridge, NJ 07656 (201) 930-1000 circle 578 on reader service card	KX-1211HG2	12 inches	600 x 400	Analog/TTL	16	not available	.40	no	yes, with RGB interface adapter PC- 7012	<b>\$895</b>
<b>TSK (Taxan)</b> 1524 Highland Ave Duarte, CA 91010 (214) 810-1291 circle 577 on reader service card	RGBvision III	12 inches	630 x 280	TTL	infinite	18	.38	yes	yes	<b>\$649.95</b>



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Sometimes when quality is particularly important, RGB signals are used in television. In this case, the synchronizing signal (which assures that the electron beams used to assemble the picture on the monitor screen are always pointing at exactly the right place) is often combined with the green signal.

Using different conductors for RGB interconnections offers several advantages: Less circuitry is necessary inside both the monitor and computer; fewer manipulations of the signal are needed; and the bandwidth (which directly translates into resolution and therefore picture quality) is not so severely limited.

### Resolution and the Shadow Mask

Once the limitations of the NTSC signal are overcome, the ultimate quality of a monitor's image is limited by the picture or cathode ray tube (CRT) that it uses. The image on a monitor screen consists of thousands of glowing dots of phosphor on the inside surface of the screen. These phosphor dots are arranged in groups of

strikes only the dots of a particular color.

All color picture tubes, whether used as monitors or televisions, have a "shadow mask," a metal sheet with fine perforations in it, located just behind the phosphor coating inside the display tube of the screen. Some tubes, like Sony's Trinitron, are a bit different but based on the same concept. Slots rather than holes are used in the shadow mask to let the beams pass through, and color stripes rather than phosphor dots make up the image.

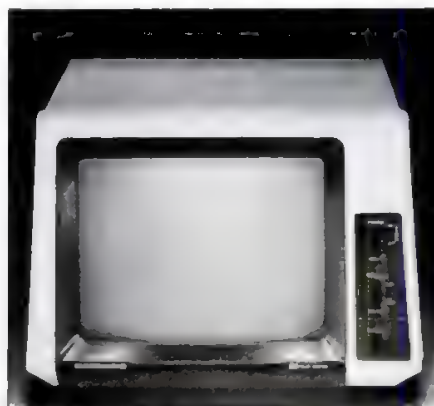
The shadow mask prevents electron beams in the CRT from striking unintended phosphor dots and activating the wrong colors on the screen. Essentially, the electron gun must shoot through the holes in the shadow mask to hit the appropriate phosphor dots.

The spacing of the holes determines the arrangement of the phosphor dots on

each eight dots wide, for a total screen width of 640 dots. The typical 12-inch (diagonal) monitor screen is roughly 9.5 inches, or about 240 millimeters, wide. Consequently, to display an IBM PC text image properly, the dot pitch must be smaller than .375 (or 240/640) of a millimeter. This example assumes that the full width of the screen is used for display. Often, a monitor's image is somewhat smaller than full screen width and requires an even finer dot pitch. Larger displays can use correspondingly larger dot pitches and still achieve the same image quality.

The vertical resolution required by the IBM PC is not nearly so strict; 24 lines of

***T***HE STRICT limitations that made NTSC necessary need not apply to personal computer systems.



Model 1301 by Electrohome

the CRT screen and the degree of detail of an image on the screen. This "dot pitch" density determines the fineness of detail in the color resolution.

Color tubes can be divided by dot pitch into three general classes: consumer television quality, with dot pitches .62 millimeter or larger; general purpose display tubes, with dot pitches from .40 to .62 millimeter; and high-resolution displays, with dot pitches smaller than .40 millimeter. The extra precision required in manufacturing generally makes tubes with finer shadow masks and smaller dot pitches more expensive.

It's easy to compute the pitch necessary for a given computer system. The screen size is divided by the number of dots necessary to form the characters across the screen. A typical IBM PC display consists of 80 columns of characters,

***D***IGITAL signals have no in-between levels, so each primary color is either turned on or off.



Hitachi's Model CM 1472

text, each line eight dots high, require only 200 lines of resolution. This is easily obtained from the .375 millimeter or smaller dot pitches required for the necessary horizontal resolution.

### Analog Versus Digital Inputs

Television and computer monitors differ in another important respect. Although a television picture consists of various shades between light and dark, the graphic picture presented by most computers



The Quadchrome monitor by Quadram

three (or triplets), one for each of the primary colors of light. They are made to glow by electron beams shot from three electron "guns" located in the neck of the tube. The electron beam from each gun



# **P**oor *convergence results in images with rainbow- like shadows and a loss of sharpness and detail.*

has few gradations. The IBM PC, for example, displays everything in only two levels of brightness.

To display various brightness levels,

television monitor inputs use analog signals, which are electrical waveforms that vary smoothly and continuously with time. The analog signal could be at any one of an infinite variety of voltage levels at any given instant. Each voltage level corresponds to a different brightness or shade of gray on the display screen. Analog signals control each of the colors in a television monitor with such precision that a nearly infinite variety of hues and shadings can be created.

The IBM PC controls its monitor signals differently. It uses digital (on/off) signals. These digital signals have no in-

between levels, so each primary color is either turned on or off at each given dot position on the screen. The combination of the three primary colors turned on at each dot position determines the final color shown on the screen.

With three different control signals (one for each of the primary colors, the RGB), each using a different data bit, eight colors ( $2^3$ ) can be produced. By using one additional data bit to control the intensity of the electron beam in the monitor (one bit allows coding of two intensity levels, dim and bright, which correspond to the data signal being on and off), the IBM PC doubles the color palette to 16 colors; at high intensity, there are two values of red, and so forth. Some otherwise PC-compatible monitors do not recognize the added intensity bit and are limited to eight colors. The PC color monitor (and recent models of some other monitors), generate brown by detecting the digital signals that indicate "light yellow." Instead of brightening the yellow, these monitors change the color mixture to add extra red to the yellow blend.

Digital data is sent from the PC systems unit to the monitor as a standard logic signal called transistor-transistor logic (TTL). TTL indicates that an RGB monitor's inputs need a logic signal or signals of a certain industry standard voltage and current level. The RGB outputs of the IBM PC are compatible with this TTL level.

The systems unit also sends two separate synchronizing signals to the monitor to ensure that the electron beams in the monitor's CRT point at the right group of phosphor dots. The vertical synchronizing signal tells the monitor to refresh its complete screen 60 times per second; the horizontal synchronizing signal tells the monitor when each new display line begins (200 times per vertical interval).

It is important to realize that the IBM PC is not directly compatible with analog input RGB monitors. Although technicians can create relatively simple circuits to mate the PC with an analog input monitor, a ready-made adapter may be rather difficult to find.

## **Choosing an RGB Monitor**

The best way to select a high-resolution monitor is to search for picture problems in any model you are considering.

The first characteristic to check is "convergence." The three electron beams

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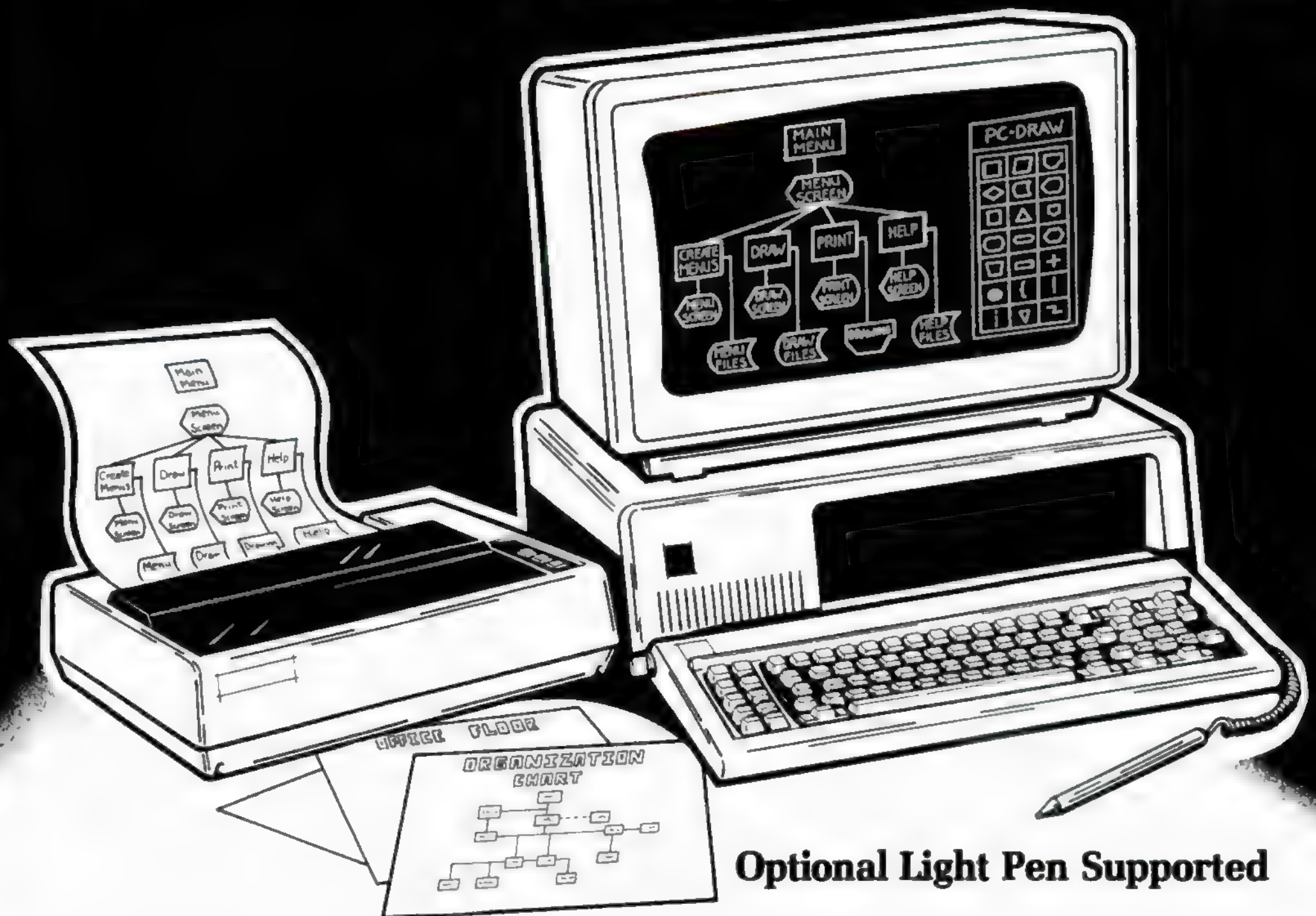
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## NTSC: Never The Same Color

*The limitations of color transmission in the U.S. originated at a time when television was dominated by black and white.*

The big culprit in the poor technical quality of U.S. television images (and why televisions make poor computer monitors) is not the sets themselves but something called the NTSC. Officially it means "National Television Standards Committee," but more likely than not, a television engineer will tell you that it stands for "Never The Same Color."

The standards used for color television signals broadcast in the United States (and Japan) were written by the NTSC. Consequently, the signals themselves are often called simply "NTSC."

The reason that there is a standard at all is so that the color signals sent by all U.S. television stations can be received by all television sets in the U.S., a worthy goal now taken for granted.

Thirty years ago, however, setting such a standard was a technological challenge. Color television was new, and various systems of color broadcasting were under consideration. In the end, it was neck and neck between two: one that would be compatible with all the black and white television sets then in use, and one that was

**T**HAT COLOR could be squeezed in at all was a technical miracle in the fifties.

not. The first system, championed by RCA, won. It became the NTSC standard that Americans must live with today.

The big challenge in developing compatible color television was to stuff extra information about the video picture—the color information—into the airwaves already occupied by the black-and-white signal. That color could be squeezed in at all was a technical miracle in the fifties, when vacuum tubes were high technology and room-sized computers boasted capabilities that pale when compared to the microcomputers of the 1980s.

### Mixing Signals

The NTSC is like any other color system in that the color image is broken into three component images, each representing one of the three primary colors of light: red, green and blue. (Any color can be created by mixing different proportions of the primary colors.)

The NTSC system begins with three television signals, the RGB signals, one for each of the primary colors of light. Then these signals are mixed together to create three intermediate signals: the "luminance" signal, which specifies brightness, and two "chrominance" signals, which specify color information.

The luminance signal contains all the necessary brightness or black-and-white information and is fully compatible with a normal black-and-white signal. The two chrominance signals, however, are squeezed together on top of the luminance signal on a subcarrier of about 3.58 MHz. However, there simply isn't enough room in the signal to stuff in all the requisite color information. This shortage of space (actually, limited bandwidth) means that some colors are restricted to one-third of the black-and-white resolution by the NTSC process—and others are restricted to about one-ninth of it.

Synchronizing and control information is added to the luminance/chrominance mix along with a "color burst" (which helps television sets guess what the colors should be on the screen) to make a "composite" video signal.

The only reason color television is watchable at all (disregarding program content) is that the human eye does not see color differences as sharply as brightness differences and therefore does not notice the lack of color resolution. Or so say proponents of the NTSC system, who are becoming fewer and fewer.

High-resolution monitors use RGB signals before they get squashed together by the NTSC process. Consequently, RGB signals do not suffer the limitations of the NTSC process and can present sharper, clearer on-screen color images with higher resolution.

—WR

inside a monitor must converge on exactly the right point on the screen to illuminate a single set of phosphor dots, or pixel. If a monitor is not adjusted properly, or if it is not properly designed or assembled, the three beams will not converge correctly. Poor convergence results in images with

**T**HE EASIEST way to identify a convergence problem in a computer monitor is to fill the screen with text in white.

rainbow-like shadows and a loss of sharpness and detail.

Because the electron beam inside the display tube is bent sharply to reach the corners of the screen, convergence problems will probably appear in the corners of a display. The easiest way to identify a convergence problem in a computer monitor is to fill the screen with text in white (the combination of the three primary colors) and examine the letters in all four corners of the screen. Should the white characters have distinct "shadows" of red, blue, and/or green, you have probably located a convergence problem.

After checking convergence, you should check resolution. According to one source, if you look closely at the screen of a color monitor, you can see the shadow mask lurking behind. If you can see the holes in the mask, they are most likely .40 millimeter or larger. If you can't see the holes, they are probably .31 millimeter or smaller. A more straightforward test is to examine a screenful of text (80 columns by 24 rows) to be sure that all the letters are adequately sharp and discernible.

In regard to convergence or resolution, sometimes the literature describing a monitor speaks of the positioning of the electron guns as "in-line." (The unpublished alternative is mounted in a "delta," which means that the guns are arranged at the vertices of an equilateral triangle.) In-line guns are generally easier to converge (point in the proper direction) and can be "self-converging," which obviates the



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need for electronic convergence circuitry. The picture tube subsystem, however, may still require convergence adjustments. Less circuitry means lower prices.

On the other hand, a delta arrangement of the electron guns can produce higher picture quality with sharper focus. This difference is important in critical scientific applications, but it probably will not be apparent when using the IBM PC.

Properly converging a color monitor requires special tools and skills. You should never tamper with convergence adjustments. If a monitor passes your personal visual inspection, convergence and resolution tests, there's little reason to worry how the guns are mounted.

While you have the screen full of text, continue your inspection by examining the top and bottom rows of the display to make certain that they include all parts of each individual letter, particularly the top line or two of the uppermost letters and the bottom lines of the lowermost letters. Some monitors may have a tendency to cut slightly into these characters.

If you plan to run color graphics programs, you should check the geometric

may be important. To produce higher resolution some graphics boards may use a technique called "interlaced scanning."

---

**MAKE SURE**  
*that straight lines are  
straight and that  
squares are not  
trapezoidal.*

---

Although interlaced scanning can double the vertical resolution on a monitor screen, each line on the screen is refreshed only half as often. Instead of being refreshed 60 times a second, the image is refreshed 30 times a second. Normal phosphors on the screen will "flicker," producing a jumpy image, because normal phosphors may not retain their brightness long enough to fool the human eye into thinking the screen is continuously lit. Long persistence phosphors can make this flicker minimal.

Long persistence phosphors can cause problems of their own. They may cause "smearing" and after-images. Also, long persistence phosphors are generally not as efficient as standard phosphors. Their low efficiency could cause a low brightness that would be unsuitable for use in a workspace with bright ambient lighting.

When examining monitors be sure to note that some screens are etched or coated to reduce glare. Most people find reduced-glare screens easier on the eyes. Although the various anti-glare finishes vary in durability, most resist the usual cleaning solvents. And while there may be slight differences in the apparent effectiveness of anti-glare treatment techniques, the important consideration is that reflections from the screen should not interfere with your ability to see and read what's there.

The black matrix screen is part of the legacy of advertisements for consumer model television sets. The term "black matrix" refers to the background surrounding the colored phosphor dots on the screen. A darker background makes the glowing color dots stand out better; this results in better contrast and, ulti-

mately, easier viewing. Most high-resolution color monitors use a dark matrix.

Nonblack matrix tubes produce better whites (the black of the matrix tubes makes whites look grayer), which may be desirable for specialized applications (like making photographs of the screen image). For general purpose monitor applications, the readily available black matrix screens are probably best.

### Interference and Style

If you're not a hermit, you may want to check a prospective monitor for compliance with FCC regulations. These were written to insure that monitors do not cause interference to nearby radio listeners or television viewers. The rest of the family may not be delighted if your computing preempts Julia Child's recitation of her favorite means for boning and preparing Rock Cornish game hens.

The FCC has two different standards for the maximum allowable interference resulting from computing devices: Class A, which applies to business equipment; Class B, which applies to computers destined for home use. Because Class B standards are much stricter, a monitor that complies with them will help keep neighbors from pounding on your door every time you run a graphics program.

Although the cabinet of a monitor has little effect on its performance, it can still be important. When you're examining monitors, don't forget to consider whether you can live with its styling.

---

**IFA**  
*monitor passes  
inspection, there's little  
reason to worry about  
which way the guns are  
mounted.*

---

performance of the monitors you are considering acquiring. Make sure that straight lines are straight and that squares are not trapezoidal. Use a variety of graphics for a thorough test; a problem like poor voltage regulation (which can cause straight lines to waver) may only become apparent when great demands are made on the monitor's power supply; for example, when the monitor displays bright, intersecting horizontal and vertical bars.

Should you use a color/graphics board other than the one supplied by IBM, the "persistence" of the monitor you select

Remember, the purpose in buying any high-resolution color monitor is to facilitate communication between your PC and your eyes. You must be the ultimate judge. The monitor you choose should be the one that looks best to you, both on the screen and in your home or office. /PC



# TECMAR

THE **POWER**  
BEHIND THE PC



IN THE COMPLEX PRODUCT MARKET OF  
IBM PC ENHANCEMENTS, NO ONE OFFERS:

- More complete IBM PC expandability
- More solutions to today's business and technical computing problems
- More assurance of future compatibility with the next generation of technology
- More product reliability

TECMAR IS THE SAFE DECISION FOR TOMORROW'S PRODUCTS  
**TECMAR** THE ONLY NAME YOU'LL NEED TO KNOW

CIRCLE 619 ON READER SERVICE CARD



# ComNet™ FROM TECMAR

## NETWORKING

- Ethernet
- Electronic mail
- Device sharing
- No dedicated server required
- Operates with no floppy-based system
- Remote job execution
- File lock out
- Password protection
- Server back-up available

## TELEPHONE SUPPORT

(available through modem board)

- Autodial - with extended telephone numbers
- Auto Redial
- Call Forwarding
- Length Of Call Indicator
- Directory Support - with unlimited number storage
- Message Support - either leave or obtain messages. Receive messages remotely
- This unit (with a handset) substitutes for a telephone

## MODEM

- Gateway to networks
- Electronic mail
- Device sharing
- Remote job execution
- File lock out
- Password protection
- 300 to 1200 baud modems available
- Data in network can be obtained by decoding touch-tone sequence or through voice recognition prompt
- Respond to remote terminal
- Access dictating systems on network. Control them by touch-tone decoding
- Programs or calculator can be used remotely. The touch-tone keypad can be used to provide numeric input to programs or the calculator from a remote site (programs are loaded by decoding touch-tone sequences).

## VOICE

- Voice mail
- Voice annotated text
- Voice messages

## VOICE RECOGNITION

- Transparent keyboard. Speak instead of type
- Give commands over phone

### ComNet

ComNet is designed to meet your total communication needs including computer to computer (networking), person-to-computer and person-to-person communication requirements for data and voice.

The network protocol employed is the industry standard high speed Ethernet which permits a number of IBM PC's to be linked together by ordinary thin coaxial cable. In addition to its own computer's power, a user has the availability of other devices which are also attached to the cable - such as various printers, plotters, large disks, etc.

All versions of ComNet include an Ethernet interface and conversion of voice into data and back again. This enables one to give and receive spoken messages from any location, as well as storing the message for later transcription. The SECRETARY is the basic system with these features.

## SECRETARY \$1695<sup>1</sup>

- Ethernet Link
- Ethernet Companion
- ComNet Software



## EXECUTIVE \$2995<sup>1</sup>

- Ethernet Link
- Ethernet Companion
- Modem (300 Baud)<sup>2</sup>
- Voice Recognition
- Microphone
- ComNet Software



<sup>1</sup>With 1st MATE, 2nd MATE, or 3rd MATE in Station

<sup>2</sup>Option: 1200 Baud Modem



# IMPROVE PRODUCTIVITY THROUGH TOTAL COMMUNICATIONS SUPPORT

## DICTATING SYSTEM

- Control the PearlCorder X-02 or XR dictating system at local or remote stations through keyboard or foot pedal control or by telephone touch-tone decoding. Allows you to dictate to the "ComNet" system from any place in the world.

## FOOT PEDAL SUPPORT

- Controls dictating system
- Controls response to voice recognition

## SOFTWARE

- Time Management - alerts you to appointments at any station you are logged onto.
- Message Management - either electronic mail or voice.
- Clock/Calendar - either visual or audible.
- Calculator - either visual or audible.
- Voice Management - oversees voice mail, voice message and voice annotated text operations.

These software packages can be operated through voice recognition (even over telephone) with voice output, through the telephone keypad with voice output or through the IBM PC keyboard.

The MANAGER system adds a modem which can turn the PC into a telephone if a separate handset is added. The modem enables the MANAGER to receive unattended voice and data from any telephone in the world. The MANAGER can key in commands thru the decoding of the tones in the telephone keypad.

The EXECUTIVE is the most complete implementation of ComNet, adding computer recognition of spoken commands. An executive might phone the PC to leave or retrieve messages or request specific information. The PC, in a spoken voice, can request the user's access code (or respond to questions regarding which of several options is desired). The EXECUTIVE has the option of keying in answers or commands with the phone's tone dialing buttons, or simply speaking the answer or commands.



## MANAGER \$1995<sup>1</sup>

- Ethernet Link
- Ethernet Companion
- Modem (300 Baud)<sup>2</sup>
- ComNet Software

## HARDWARE

### ETHERNET LINK

\$950

Permits communications between computers at extremely high speeds (10 Mbits per second). The transmission mode is through single video coaxial cable with easy-to-use BNC connectors.

### ETHERNET COMPANION

\$695

Performs the function of voice digitization and voice replay, dictation machine control and foot pedal control. Also contains interface for mouse.

### MODEM

103 (300 Baud)

\$295

212A (1200 Baud)

\$695

- 103 (300 Baud) or 212A (300 or 1200 Baud)
- Pulse/tone automatic dialer
- Dual tone DTMF receiver (decodes touch tones)
- Auxiliary voice circuit
- Auxiliary, optically coupled, ring indicator output (capable of being used for auto power-on)
- Can replace telephone with the addition of a handset

### VOICE RECOGNITION

\$995

### MICROPHONE

\$170

User-dependent 100 word recognition (200 words optional) with 98% accuracy. Permits computer to respond to voice input.

### MORE TO COME...

ComNet FROM TECMAR

AVAILABLE IN JULY, 1983

## SOFTWARE

Cost per station equipped with Tecmar

1st MATE,™ 2nd MATE,™ or 3rd MATE,™

\$100 per station

Cost per station not equipped with Tecmar

1st MATE, 2nd MATE, or 3rd MATE,

\$300 per station

# TECMAR

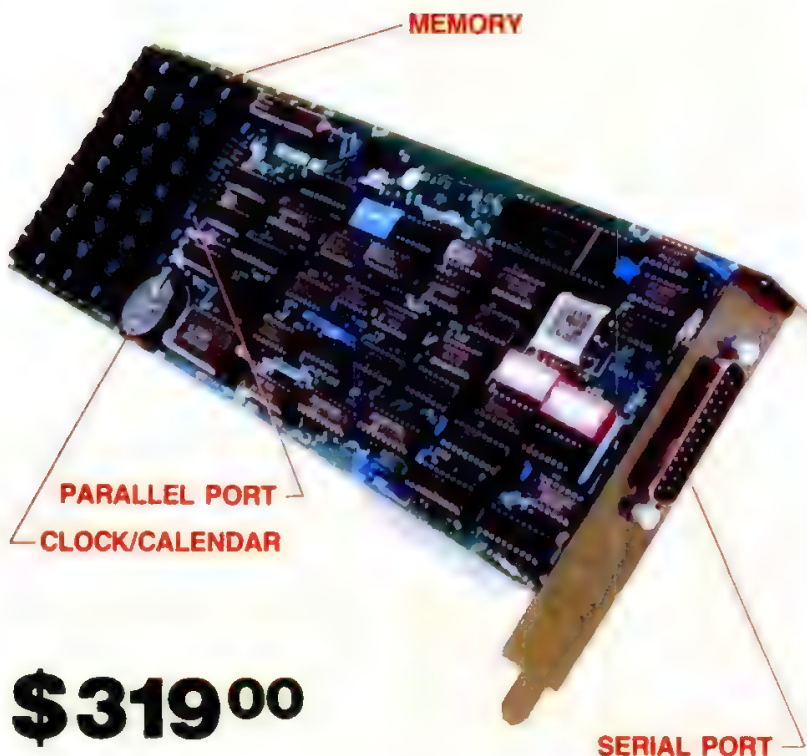
23600 Mercantile Road  
Cleveland, Ohio 44122

Phone: 216-464-7410 Telex: 241735

CIRCLE 627 ON READER SERVICE CARD



# FIRST FROM TECMAR

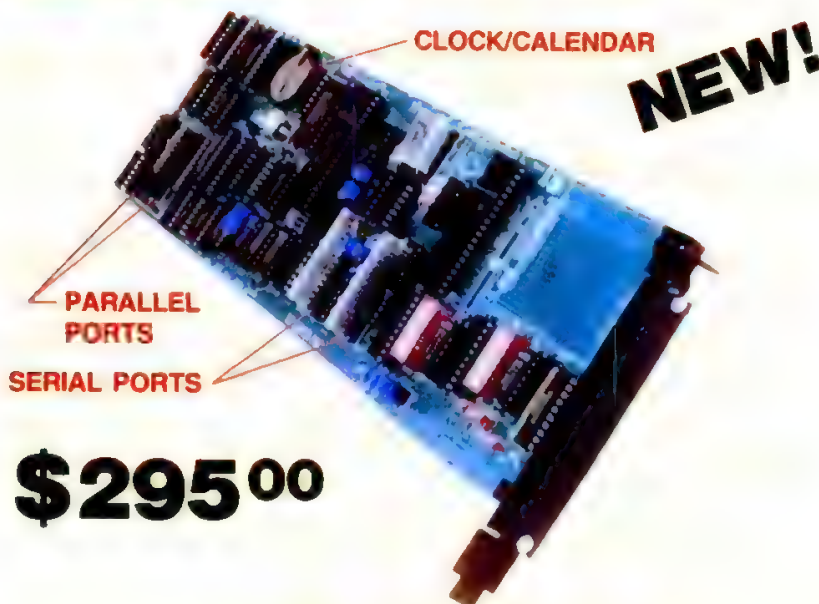


**\$319<sup>00</sup>**

SERIAL PORT



Two 64 KILOBYTE MEMORY KITS will upgrade your 128K PC to 256K.



**\$295<sup>00</sup>**

**NEW!**

## 1st MATE™

**\$319/Unpopulated Memory**

**\$389/64K \$469/128K**

**\$539/192K \$589/256K**

**TECMAR'S TOP OF THE LINE  
MULTI-FUNCTION BOARD**

Performs eight (8) key functions in one (1) expansion slot with upgradeable (expandable) memory.

- 0 to 256K Memory - fully socketed for easy field upgrade
- Versatile - each 64K fully addressable
- CLOCK/CALENDAR - with easily replaceable battery for back-up
- SERIAL PORT for communications - PC compatible (COM1, COM2 or other)
- PARALLEL PORT for printer - PC compatible (LPT1, LPT2 or other)
- RAM SPOOLER - easy to use - allows printing to become background task - choice of 8 memory sizes
- SPEED DISK - simulates ultra high speed disk
- AUTO-TIME - provides automatic insertion of date & time at power on
- Accepts exclusive PAL Option to restrict certain information on a "need to know" basis or to protect software
- Includes all connectors and cables
- Compatible with COMPAQ personal computer

## 64 KILOBYTE MEMORY KITS

**\$85**

**USE TO UPGRADE THE  
PC XT SYSTEM BOARD OR  
PC-MATE 1st MATE**

## 2nd MATE™

**\$295**

A wide range of I/O options - 4 ports with a clock/calendar when memory is not necessary

- Two (2) SERIAL PORTS for communications, quality printers, modems - PC compatible (COM1, COM2 or other)
- Two (2) PARALLEL PORTS for printers - PC compatible (LPT1, LPT2 or other)
- CLOCK/CALENDAR with easily replaceable battery for back-up
- Accepts exclusive PAL Option to restrict information on a "need to know" basis or to protect software
- Two (2) cables - one (1) serial, one (1) parallel - included
- Compatible with TI Professional and COMPAQ personal computers



# PC MATES™ - A COMPLETE SERIES OF MULTI-FUNCTION MEMORY/COMMUNICATIONS BOARDS THAT GIVE YOU TOTAL VERSATILITY TO CONFIGURE YOUR SYSTEM.

## 3rd MATE™ \$445 ON-BOARD MODEM AND I/O OPTIONS

Pulse-dialing supported with no external cables or wiring. All you need is a phone jack.

- **MODEM** - 300 Baud, Bell 103, auto-dial, pulse-dialing supported, on board
- **SERIAL PORT** - for additional communications - PC compatible (COM1, COM2 or other)
- Two (2) **PARALLEL PORTS** for printers - PC compatible (LPT1, LPT2 or other)
- **CLOCK/CALENDAR** with easily replaceable battery for back-up
- Designed to accept exclusive **PAL Option** to restrict certain information on a "need to know" basis or to protect software
- Two (2) cables - one (1) serial, one (1) parallel - included
- Compatible with TI Professional and COMPAQ personal computers

**NEW!**



**\$445<sup>00</sup>**

## Scribe Tender™ \$195

Combines three (3) IBM options on one (1) multi-function board

- Two (2) asynchronous **SERIAL PORTS** identical to IBM ports, (COM1, COM2 or other) fully programmable
- Complete status reporting
- One (1) **PARALLEL PORT** emulates IBM printer adapter board, (LPT1) including software capability
- Compatible with TI Professional and COMPAQ personal computers

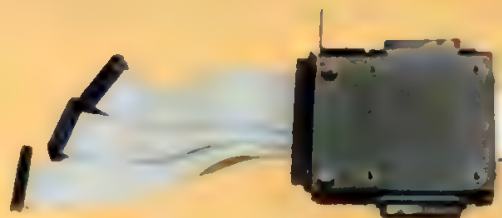


**\$195<sup>00</sup>**

## Triporter™ \$95

Designed to provide easy access to the connectors on multi-function boards, such as the Tecmar Scribe Tender, 1st MATE, 2nd MATE, 3rd MATE. Provides for mounting of up to four (4) male or female DB25 connectors on back of IBM PC or Tecmar Expansion Chassis slot. (Cables \$25 extra)

- Easy to install
- Accommodates 26 conductor cables
- Mounts in expansion slot opening
- Housed in steel case



**\$95<sup>00</sup>**

### THE TECMAR PRODUCT LINE ADVANTAGES

- All Tecmar products carry a full one (1) year warranty
- Guaranteed 72 hour repair service (24 hour average)
- Total compatibility with IBM PC and all Tecmar products
- Proven reliability
- Strong manufacturer's support with immediate access to Customer Service
- Largest selection of IBM PC compatible products in the world

# TECMAR

23600 Mercantile Road  
Cleveland, Ohio 44122  
Phone: 216-464-7410 Telex: 241735  
CIRCLE 553 ON READER SERVICE CARD





**TECMAR**  
**\$1795.00**

complete with  
controller & cartridge

**FIRST  
FROM  
TECMAR**

**NEW  
REMOVABLE  
CARTRIDGE  
WINCHESTER**

This is the breakthrough in storage that IBM PC people have been waiting for, as Tecmar engineering keeps you moving ahead.

- the new SyQuest 5 Megabyte removable cartridge Winchester disk drive
- complete, easily installed in IBM PC or available in IBM-compatible Tecmar expansion chassis
- new Tecmar superspeed controller
- Tecmar disk sharing for up to 4 IBM PCs
- your best solution for mass storage, and the most sensible back-up system available

We believe this is the future in storage because we have proved its reliability and its advantages. The new removable cartridge gives you unlimited memory at a lower price tag than the basic Winchester at comparable speed.

**\$1795** complete with  
controller & cartridge  
AVAILABLE NOW AT YOUR TECMAR DEALER

Write for new Tecmar Information Kit.

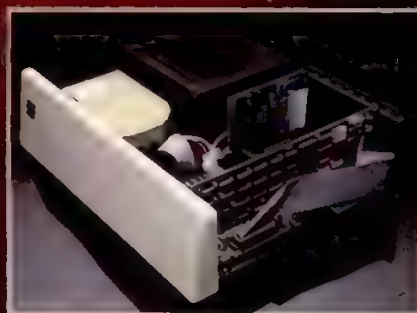
**TECMAR**

Personal Computer Products Division  
23600 Mercantile Road  
Cleveland, Ohio 44122  
Phone 216-464-7410/Telex 241735



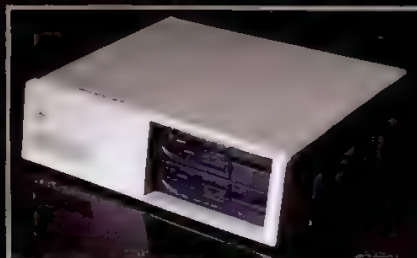
**TECMAR COMPATIBILITY, VERSATILITY,  
RELIABILITY, AFFORDABILITY,  
RESPONDABILITY**

The first and only complete line of fully compatible expansion options for IBM PCs, including every type of disk drive



**NEW SHARED WINCHESTER PC-MATE™**

Our new GT subsystem upgrades our original with 3 times faster speed, sharing for up to 4 IBM PCs. Controller Board available for upgrade on trade-in.



**PC-MATE™ FLOPPY**

Controller Board will handle 5¼" and 8" disks. Winchesters can be installed in our floppy subsystem cabinet.

CIRCLE 616 ON READER SERVICE CARD



**TECMAR**  
**\$1595.00**

**PC-MATE BAK-PAK  
WINCHESTER BACK-UP 6.25  
MEGABYTE DISK PACK**  
**\$1595.00**

The "Bak-Pak" System comes in an IBM-Compatible/PC-MATE Mini-cabinet complete with software, power supply, controller and cables. Features removeable media in packs with 6.25 megabytes of formatted storage per pack. Additional packs available at \$95.00.

The controller substitutes for the IBM floppy disk controller, so no additional slots are necessary. Also can be used as primary high capacity storage system.

**TECMAR**  
**\$3995.00**

**HIGH CAPACITY STORAGE  
26 MEGABYTE WINCHESTER**  
**\$3995.00**

Comes in IBM Compatible/PC-MATE Mini-cabinet complete with software, power supply, controller and cables.

- Compatible with all Tecmar disk-expansion systems
- Allows disk sharing for up to four (4) IBM PCs

26 Megabyte Winchester is also available in IBM-Compatible PC-MATE Expansion Chassis which offers an additional five (5) expansion slots and independent power supply for \$4295.00.

Other Winchesters From Tecmar:

- 10 Megabyte in Mini-cabinet - \$2495.00
- 15 Megabyte in Mini-cabinet - \$2895.00
- 10 Megabyte in PC-MATE Expansion Chassis - \$2795.00
- 15 Megabyte in PC-MATE Expansion Chassis - \$3195.00

Other configurations of fixed Winchester, removeable cartridge Winchester and 8" floppy disks are also available from Tecmar. Contact your local dealer or check Tecmar's full-line catalog for details.



**5 MEGABYTE REMOVEABLE  
CARTRIDGE WINCHESTER  
FOR BACK-UP \$1995.00**

Comes in IBM-Compatible/PC-MATE Mini-cabinet complete with software, power supply, controller and cables.

Can be used as the stand-alone primary high capacity storage device.

**WATCH THIS SPACE**

New! Tecmar Tape Back-Up  
Coming Soon

**BACK-UP  
SYSTEMS  
SOLUTIONS**

**HIGH  
CAPACITY  
STORAGE  
SOLUTIONS**

Call or write for the latest catalog of PC-MATE peripherals from TECMAR. Updated continuously as new products come on-line.



**TECMAR  
THE ONLY NAME  
YOU NEED TO KNOW**

CIRCLE 549 ON READER SERVICE CARD



# TECMAR'S AFFORDABLE INDUSTRIAL/SCIENTIFIC LINE FOR THE IBM PC

## CONFIDENCE IS NO EXTRA CHARGE.

### COMPATIBLE

All TECMAR products are designed to be fully compatible with each other and the IBM PC for smooth, trouble-free performance in your system.

### SUPPORTABLE

Our philosophy of total support adds uncommon value to your TECMAR products. All TECMAR boards feature a one-year warranty, with guaranteed 72-hour maximum repair turnaround on all standard products. Replacement loaner units are available. Thorough and straightforward documentation comes with each unit. Our customer service staff is available to answer questions or solve your problems.

### EXPANDABLE

Our products allow easy expandability, so your system capabilities can grow with your needs.

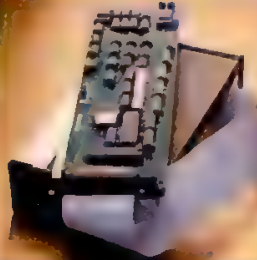
There's more! TECMAR's broad line of compatible IBM PC Industrial/Scientific products includes:

- High Resolution Graphics
- 5¼" and 8" Floppy Disc Controller
- Video Digitizer
- Video Cassette Recorder Controller
- Speech Synthesizer
- Voice Recognition
- D/A Converter
- Stepper Motor Controller
- EPROM or EEPROM Programmer/Reader
- Static RAM/ROM
- CMOS Memory



**IEEE488 INTERFACE** **\$395**  
**plus SOFTWARE** **\$95**

Board implements IEEE488 industry standard to enable PC to operate as system controller or as an addressed talker/listener. Has DMA and interrupt capabilities. Available library of machine-language subroutines called from BASIC or FORTRAN for data transactions with PC. Order #20030 INTERFACE #30030



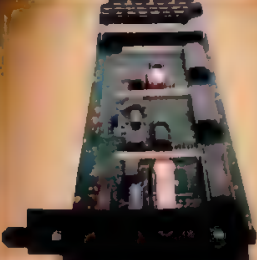
**LAB MASTER™** **\$995**

A sophisticated system that includes 16 channels of 12-bit A/D with a 30KHz conversion rate, two channels of 12-bit D/A, five timer/counters, and three 8-bit parallel ports. Options include programmable gain up to 1000, 14- and 16-bit accuracy, 40 and 100 KHz conversion rate. Order #20009



**LAB TENDER™** **\$495**

An economical and versatile system designed for data acquisition and control applications. Includes 16 channels of 8-bit A/D conversion, 16 channels of 8-bit D/A conversion, five timers, and three 8-bit parallel ports. Order #20028



**BASE BOARD™** **\$345**

Digital Input/Digital Output board with four sections of 24 DI/DO lines. Each section can be used as a stand-alone DI/DO interface or with a daughter board for prototyping or specific functions such as opto-isolated input or opto-isolated output. Order #20025

We are proud to offer the largest line of options available anywhere for the IBM Personal Computer. All Tecmar products are designed with advanced technology as it becomes available. We add new products monthly like the PC-MATE removable Cartridge Winchester drive. TECMAR offers complete reliability and backs it up with support.

# TECMAR

PERSONAL COMPUTER PRODUCTS DIVISION  
 23600 Mercantile Road  
 Cleveland, Ohio 44122  
 Phone (216) 464-7410 Telex 241735

Call or write for the latest catalog of PC-MATE peripherals from TECMAR. Updated continuously as new products come on-line.





# PCMATE™

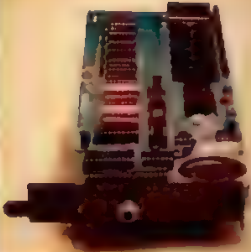
## SOLUTION-ORIENTED DESIGN WITH THE USER IN MIND

### A FULL LINE OF PROBLEM SOLVERS



**DIGITAL TO ANALOG AND  
DIGITAL INPUT/OUTPUT  
(DADIO) \$395**

This accurate, high-speed unit has 16-bit digital-to-analog conversion that can be programmed for 12-bit resolution. It features 16-bit parallel ports. Can con-



**SPEECH MASTER \$395**

For application where verbal communication is required, the VOTRAX phoneme-level speech synthesis system, developed by the NATIONAL BUREAU OF STANDARDS, is used. Features an on-board speaker with provision for external speaker.



**VIDEO VAN GOGH \$345  
plus SOFTWARE \$95**

A video digitizer that interfaces TV cameras to the PC. Will digitize a black and white picture in six (6) seconds with resolution of 256H by 256V. Features a 16-bit parallel port. Digitization and display of a video picture, transfer to disk storage, image-graphics, cursor control and point digitization.




**DEVICE MASTER \$245  
plus SOFTWARE \$35**

Can be used for energy management, security, or just for convenience. This interface for the BSR X-10 unit turns electrical outlets on or off and dims lights without additional wiring. It uses no direct AC connection, avoiding damage to the computer. Contains a keyboard.



**VIDEO CASSETTE RECORDER  
CONTROLLER \$495**

Controls all remote functions on the VHS 902500. Codes each frame so the user can locate any particular frame. Can store and retrieve information to any length. Removes and displays exact frame numbers and other information. TECMAR'S GRAPHICS will make a computer display can be superimposed on the video picture.



**STEPPER MOTOR  
CONTROLLER \$245**

Controls stepper motor drive from a PC. Can be programmed through the IBM PC or compatible hardware or drive up to 1000 steps. Features a 16-bit parallel port and labeled 8-bit and two (2) independent labeled 8-bit TTL.



**EEPROM PROGRAMMER/  
READER \$495  
EEPROM EXPANSION \$595  
EEPROM SOFTWARE \$95**

Programs and reads 16-bit parallel ports. Can be programmed for 12-bit resolution. Features 16-bit parallel ports. Can con-



**TIME MASTER \$135**

Clock/calendar with five (5)-year battery back-up and software auto-time. Features a 16-bit parallel port. Can be programmed for 12-bit resolution. Features 16-bit parallel ports. Can con-

## TECMAR - THE ONLY NAME YOU NEED TO KNOW

CIRCLE 661 ON READER SERVICE CARD

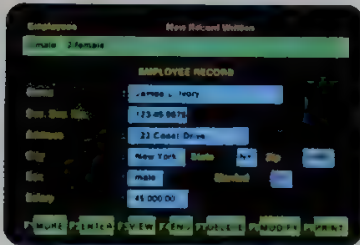


# DATAEASE™

## The Complete System To Organize Your Business The Way **You** Want It

You can start using it in minutes, and within hours have a complete application.

### It is Easy to Use:



- Fully menu driven to remove the guesswork.
- Full use of function keys with the assignments always displayed. All cursor movement and editing functions on the keyboard are supported.
- Provides full color support and screen style customization.

### System Features:

- A list of users can be kept, with passwords and security levels.
- The print style is customizable.
- Data can be interchanged with mainframe computers, other data bases or spreadsheet programs.
- Data base back-up and restore functions are integrated to reduce errors.

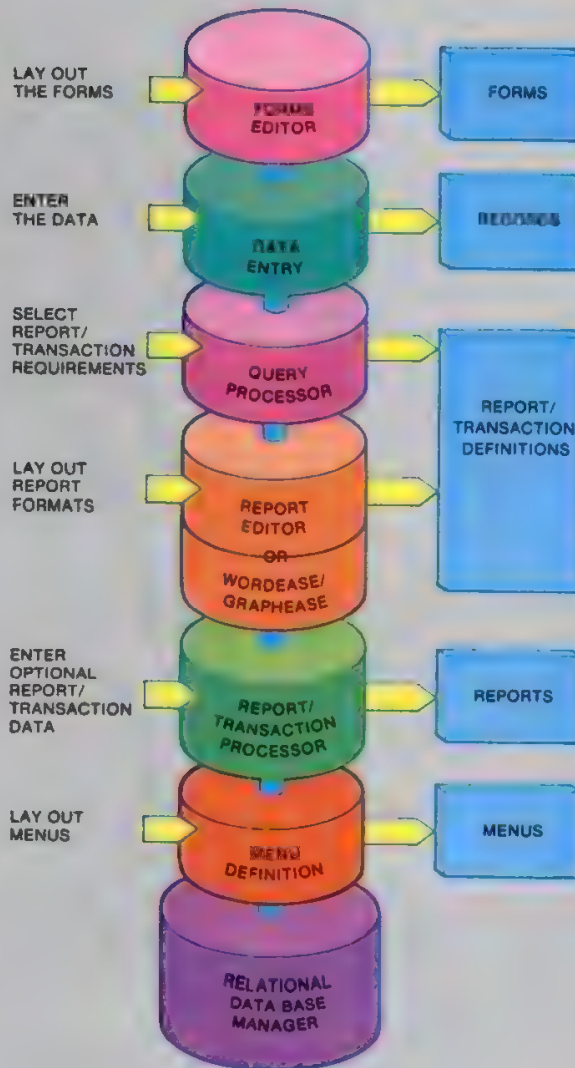
### System Requirements:

- Available on IBM-PC, DEC Rainbow and other 16 bit computers. Requires 128K of memory and 2 disk drives.
- Supports floppy or hard disk drives.
- Supports all popular printers.

### It Provides

### A Complete Range of Features:

- Lay out your forms on the screen. Define data-entry fields anywhere by answering simple questions. Revise the forms any time without losing data.
- Easy, fast and accurate way to fill-in the forms and enter, view or revise records.
- The reports or transactions requirements are defined in the English-like query language by answering simple questions. Select records any number of ways, combine up to 5 forms per report, perform calculations to get totals, sub-totals, or statistical summary. For complete transaction processing, delete, modify or enter records.
- Reports are automatically formatted in several ways, or specify your own format using the Report Editor.
- To format a report complete with text, data, and graphs; use the optional WORDEASE™ word-processor or the GRAPHEASE™ graphics facility.
- Display or print the report output, or take it to your spreadsheet, word processing, or graphics programs.
- Organize the access to your forms and reports by setting up your own menus.
- The underlying Relational Data Base Manager provides efficient storage and retrieval of records. It uses B-tree indices for efficient accessing of records, and cache memory to retain the most recently used disk sectors to reduce disk access by 50 percent.



### These are Some of the DATAEASE Applications:

Inventory Control  
Personnel Management  
Job Accounting  
Mailing List

Accounting  
Order Processing  
Market Analysis  
Financial Portfolio

Medical Office Systems  
Real Estate  
Agriculture  
Distribution Management

Social Sciences  
Bibliography  
Library Management  
School Records

## Software Solutions, Inc.

305 Bic Drive, Milford, CT 06460 • (203) 877-9268

For information, please write or call. Dealer inquiries welcome.  
CIRCLE 415 ON READER SERVICE CARD



*A responsive manufacturer, good design, and a simple, direct program more than compensate for limited documentation and an occasional bug.*

# Fast Graphs: Quick, Colorful, And Easy

## Fast Graphs

Innovative Software, Inc.  
9300 W. 110th St.  
Overland Park, KS 66210  
(913) 383-1089

**List Price:** \$295

**Requires:** 128K RAM, color graphics monitor, two disk drives.

CIRCLE 696 ON READER SERVICE CARD

The difference between a typewriter, an adding machine and a computer is that only the last can manipulate ideas and change their form. The first merely records ideas; the second simply rearranges numbers without analyzing them.

The capabilities of the PC are hardly strained when it's put to no greater use than generating letters and computing income tax. If the preceding sentence describes most of your applications, you haven't discovered graphics. With a few keystrokes, a vague list of numbers can be transformed into a chart that shows numeric relationships instantly.

"One picture is worth a thousand numbers," proclaims the advertisement for *Fast Graphs*. The ad is right. And the product delivers more than mere pictures: It charts graphs in full PC color.

Evaluating *Fast Graphs* took me from one adventure to another. My explora-

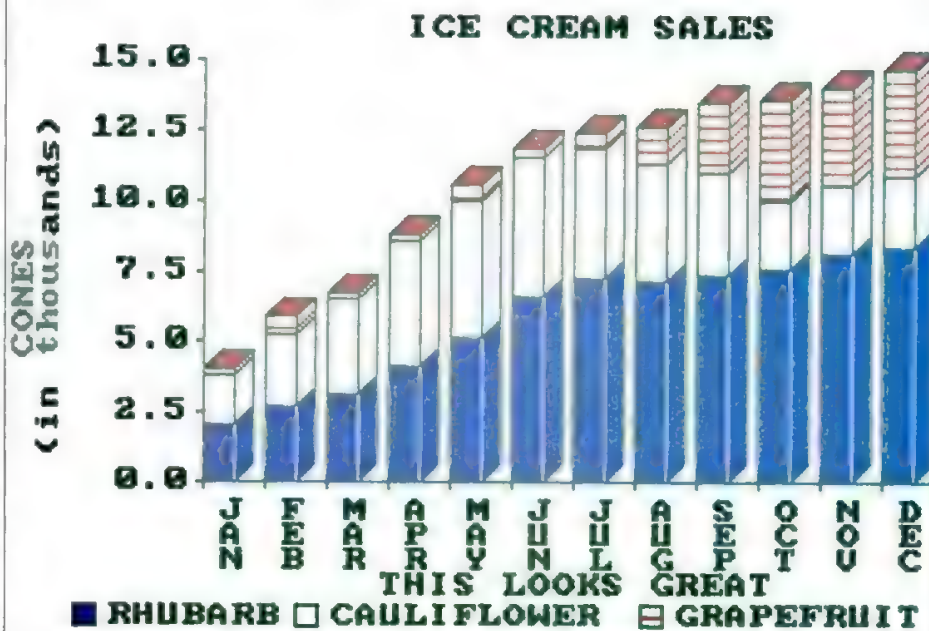
tions uncovered problems, which I shall point out shortly, that inspired several calls to the manufacturer. These were effective. I received a new, bugless (well, nearly) version of the same program.

## Initial Impressions

When version 1.0 of *Fast Graphs*

arrived from Federal Express, I ripped open the shipping carton with great anticipation. My first impression of *Fast Graphs* was very favorable. It is well-packaged, and comes complete with a new manual in a red padded IBM-sized binder. Two disks are also included; one double-sided disk that holds the program, and

Figure 1: Sample bar chart created with *Fast Graphs* 1.1





# VISIWORD MAKES IT EASY TO PUT YOUR BEST THOUGHTS FORWARD.

The better your writing is, the greater the opportunities are to clearly communicate your thoughts, sell your ideas.

The VisiWord™ program for the IBM® Personal Computer can help you make the most of every writing opportunity. It's available for both the IBM PC and the IBM XT with hard disk.

You'll write more effectively with the VisiWord program, because it's designed with the needs of the business professional in mind. It will also help you and your staff work more productively, because the VisiWord program has all the word processing functions your secretary or assistant needs.

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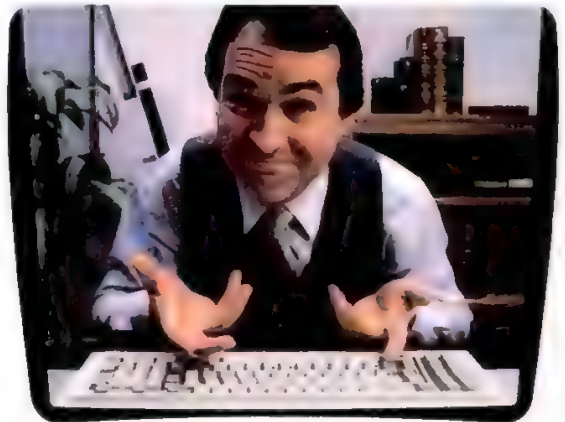
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*VisiWord*  
VISICORP™



another that contains sample programs. (A single-sided version using two program disks is also available.) *Fast Graphs*

***T*****HE OMISSIONS**  
*become apparent only  
little by little; you  
discover what you don't  
have at the moment you  
need it most.*

requires 128K RAM and a color graphics monitor. And although the literature doesn't insist on two disk drives, it ought to—as I was soon to discover.

Reading through the manual, *Fast Graphs* seemed simple enough—dump some numbers in and the program will lay a Technicolor chart across your computer monitor. The manual makes everything seem easy. I read the whole thing in 45 minutes. No numbers, no formulas: The manual assumes you know little about mathematics or even computers. It further assumes that you would rather be getting results than worrying about programming. A computerphobe's dream come true.

When the *Fast Graphs* disks begin spinning in your drives, however, you'll discover that the instructions are not nearly as complete as you thought. The omissions become apparent only little by little; you discover what you don't have at the moment you need it most. For example, the manual neglects to mention that the program disks are copy-protected and that you must run the distribution disks instead. It also fails to tell you the good news: that a single backup copy costs only \$10 and that damaged disks will be replaced free.

#### **Menu Magic**

*Fast Graphs* is completely menu-driven, which means that it presents you with a numbered list of all of its functions. You have only to choose the number corresponding to what you want it to do and then press the appropriate key.

The first menu offers the choice of three graphs: line, bar, or pie. You are given a choice of other functions, such as data entry, graphic manipulation, and print-

ing. After you make your choice, either the function you've chosen will begin or you will be confronted with a submenu. Since the functions and commands are fairly simple, you probably won't have to read the instructions at all.

#### **The First Adventure**

Before I ran the program, I read the configuration instructions, just to be on the safe side. According to these instructions, you are allowed to select the graphics mode, color or monochrome display, autostart option, default data drive, and the audio response tone (which ranges from silence for those working elbow-to-elbow in open offices, to multiple tone sequences that hint at the presence of a miniature calliope hidden somewhere in the PC chassis).

Since the machine in my office has a business-like green screen, I selected monochrome and the highest order of audio. Closing the manual, I ventured into the new world of *Fast Graphs*. In a few seconds, however, it became obvious that *Fast Graphs* and I thought in different terms. To me, the word "monochrome" refers to the typical computer monitor, green on black. According to *Fast Graphs*, however, monochrome means "high resolution, single color graphic presentation." This point may seem trivial until you discover that even in monochrome mode, *Fast Graphs* tries to display its menus in color. The monochrome monitor renders barely legible menus. Making choices calls for lots of squinting and guesswork.

Being in a congenial mood, I forgave that mistake. It stands to reason that no one would run a color graphics program without a color monitor. Later, however, I learned that versions of *Fast Graphs* after 1.01 had been changed to make the menus readable in monochrome.

The first thing *Fast Graphs* wants from you is the data from which it is to draw a chart. The data may be entered directly or may be drawn from an existing file. *Fast Graphs* revisions after 1.1 can read and write data to and from Data Interchange Format (DIF), used by *VisiCalc*. It can read and write data from *MultiPlan*, *Perfect Calc*, and *ASCII/1,2,3* files and read *SuperCalc* files. Earlier versions, however, are not as versatile.

*Fast Graphs* comes with an additional disk that contains examples. When the on-screen prompt asked for a file name, I

merely borrowed one of the examples. Next, I asked the program to draw an ordinary bar chart.

#### **Northern Lights**

While *Fast Graphs* does its thinking, it reassures you that the bytes are flowing by presenting the message "one moment please" across the screen. In about 10 seconds, the screen cleared, the labels lined up along the axes of the graph, and the bar chart began to appear on the screen.

Next, I decided to try the pie chart. I went back to the main menu, made the selection, and waited.

Suddenly the screen erupted into an aurora borealis. A storm of swirling lines spread across the screen and revealed the first slice of the pie. Another aurora display: another slice of the pie. Twelve auras for a 12-slice pie. At first I thought, "This is so much fun, it might be worth gathering the family together and going to the computer store to watch it work." On second thought, I realized that after the first 500 times, the aurora might get boring and seem like a waste of time in a business office. Finally, I decided that the display probably exists to cover up the substantial time required for *Fast Graphs* to make the computations necessary to draw a pie chart.

When the display was over, a pie chart finally filled the screen. Each section was shaded with different symbols. A key to the symbols appeared on the right-hand

***W*****HILE FAST**  
*Graphs does its thinking,  
it reassures you that the  
bytes are flowing by  
presenting the message  
"one moment please"  
across the screen.*

side of the screen. One of the menu selections, by the way, allows you to pull one or more slices from the pie if you wish.

Still refraining from taking a peek in the manual, I decided to return to the master menu to try some other functions. I don't remember my exact keystrokes, but



# How to get your fir

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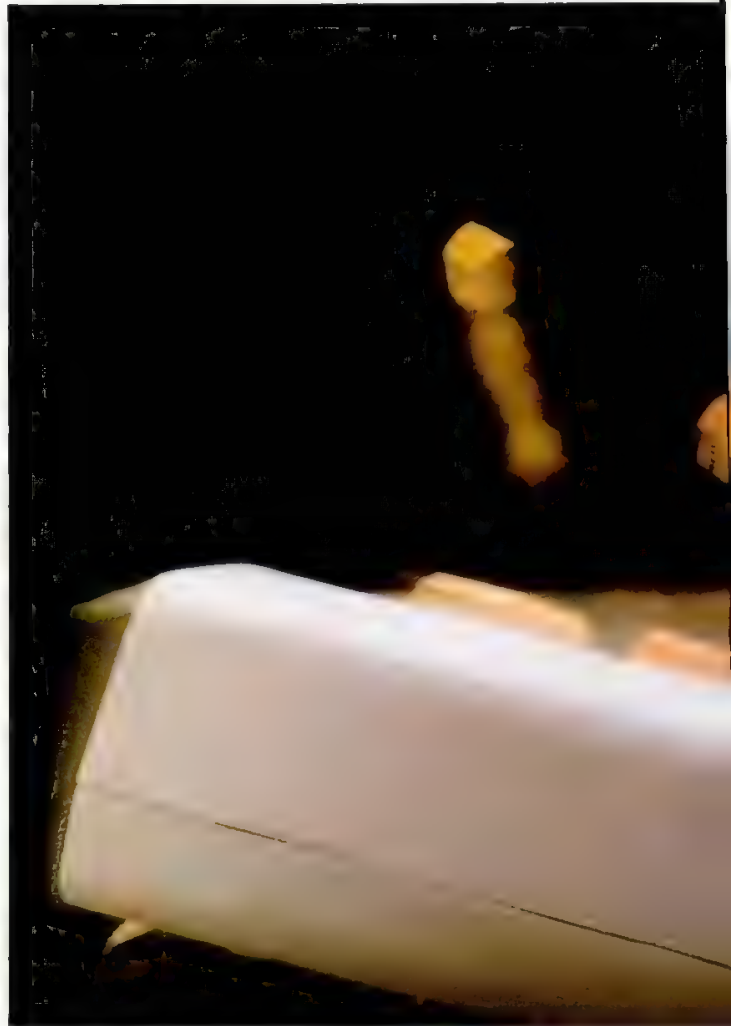
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the reassuring "one moment please" popped up and I waited.

And waited.

I waited so long, I thought about going out to lunch, until I discovered that *Fast Graphs* had beat me to it. A couple of key-strokes confirmed the PC was idling along, back in the operating system. *Fast Graphs* had crashed without giving any warning. When the symptom recurred a half hour later, I gave up for the day and decided to reread the manual. As bedtime reading it was far more interesting than staring at an unchanging screen.

I awoke the next morning to find that the computer world had changed: The PC was no longer an only child. The PC-XT and the new IBM color monitor had been released. Unfortunately, although I had a color program, I did not have \$6,000 to buy the new machines. Ever resourceful, I went to my local computer dealer and after pleading, cajoling, lying, and bribing, arranged to spend a few minutes alone with the PC-XT, the color monitor, and *Fast Graphs*. The program loaded and started without difficulty, and the crisp, sharp colors of the first *Fast Graphs* menu

began to gnaw an IBM color monitor-size hole in my budget.

This time I followed the manual and read the first section concerning data entry. Instead of loading the sample files onto the XT fixed disk, I decided to enter my own file. Part of my agreement with the dealer was that I would pay for any file I erased with my own blood.

If you've ever worked with a *VisiCalc*-clone spreadsheet, you'll be on familiar territory. Although the screen looks like you've just entered *VisiCalc*, certain constraints are placed on your data. Data entered in the A1 position becomes the temporary title of the graph. Data entered in the left most column metamorphoses into the captions for the x-axis. If you keep this in mind, data entry is easy. Just move the cursor to the position at which you want to enter a number, fill in the blanks, enter the number, and move on. If you make a mistake, repeat the procedure. Although *Fast Graphs* can save all your data in one of the standard spreadsheet formats mentioned, the data must be specially arranged to meet the particular requirements of the program. An abbreviated menu at the bottom of the screen keeps you out of trouble if you forget what to do next, such as save the data.

*Fast Graphs* incorporates the 10 left-hand special function keys of the PC. When you decide it's time to save your data, press the appropriate key and a prompt appears, asking for a file name. Another keystroke brings you back to the main menu. If you choose a selection and punch in a number, the screen turns blue and the familiar "one moment please" pops up. In a few seconds, the captions are printed and the bars are drawn. To my eyes they look bright cyan. A quick inspection confirms that the graph bears more than a superficial relationship to the numbers I dreamed up. Conclusion: with *Fast Graphs*, you can quickly be drawing charts on autopilot without a hitch.

Great! Now it's time for imagination and versatility. The selection, "Change Parameters," in the menu allows you to personalize your data display. You can create two- or three-dimensional bar charts and comparative or stacked bar charts that exhibit data from different rows of your original spreadsheet. You can also spread the bars out horizontally or vertically, change the title of the chart, insert captions at the axes, and change the scale.

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## Man Vs. Machine

Although all Fast Graphs functions work as promised, you may encounter some problems. When you switch to manual control of the range, for example, you're not completely in the driver's seat. If you chose an inadequate range that would result in an off-scale graph, Fast Graphs growls and refuses to comply. If you choose an on-scale range, you may discover that Fast Graphs plays favorites. When I entered 90 for the top of the range, Fast Graphs decided that 100 would be better. I then selected 120 and Fast Graphs did me one better, going all the way to 150! When I chose a range from -20 to +120, Fast Graphs, disapproving of my random ways, scaled up -150 to +150.

Not that there was anything wrong with Fast Graph's choices (if you like round numbers); the point is that the matter is never mentioned in the manual.

After a while, I got tired of seeing simply cyan and decided to change the color of the next chart. When I ran through the Change Bar Chart commands, however, I

suddenly noticed that they say nothing about color. Although three colors are used for displaying different data—as advertised—the choice is not yours. Or if it is, the manual doesn't tell you how to change the colors. Fortunately, I talked to

**P**ART OF MY  
agreement with the  
dealer was that I would  
pay for any file I erased  
with my own blood.

the software company and found that after a chart is drawn, pressing Ctrl-P will change the bar color and allow you to choose between two colors. Ctrl-B will change the background and run through the entire PC color spectrum. You can also return to the main menu and enter the

"edit graphic screen" mode.

This graphic editing feature is extremely versatile. Every dot on the PC screen can be changed individually to display data in whatever way you desire. For example, you can spend all night decorating your screen, or change its appearance completely by painting the background. Other commands allow you to draw lines, boxes, arcs, and circles by specifying the end point and the center (for curves) and by changing colors. In a few minutes you'll feel you're gaining on Picasso.

Fast Graphs also features a time saving function: Save Graphic Screen. Once you've drawn a picture or explained the meaning of life in a simple, easy-to-understand bar chart, this command writes the chart into the file of your choice. This eliminates the need to recompute or redraw should you ever want to refer to it or print it.

Another command allows you to overlay one graph on top of another or place it on top of a graphic screen. Just tell the program which two graphs to combine.

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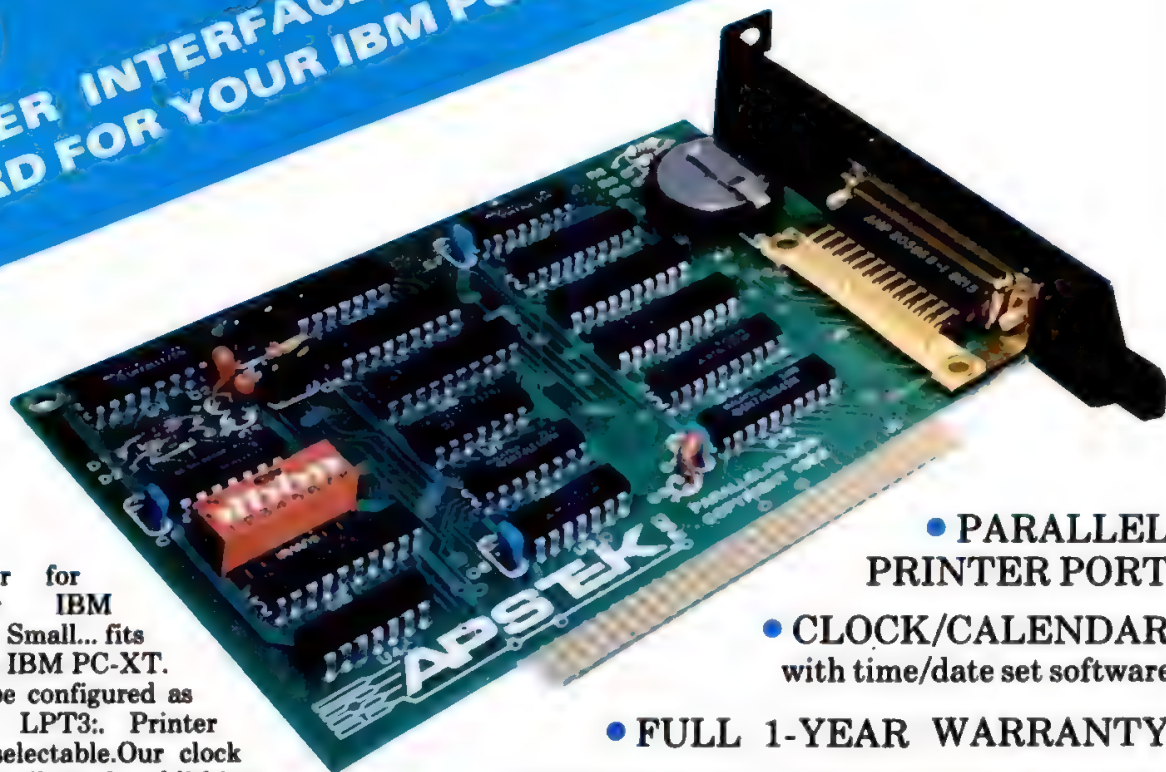
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### A Strange Bug

During my in-store XT adventure, I encountered a rather strange bug. When I told Fast Graphs to save the screen, the program asked for a file name, as usual. Once I entered the file name, however, an on-screen prompt (courtesy of PC-DOS) appeared. It asked me "to insert disk for drive B." Since a hard disk was already operating as drive B, I pressed the Enter key. The color of the screen changed to a sickly orange-red, and the screen was saved. Unfortunately, it was saved complete with the on-screen prompt.

This problem occurs when using a PC with one disk drive. Since I hadn't told Fast Graphs that it had a hard disk available, it thought it was running on a single drive system. As my dealer remarked, "You really need two drives to run Fast Graphs." The mistake was partly my fault, but the manual should have mentioned this possibility.

After a graph or any other screen is saved, it can be recalled and overlaid on another screen. This allows you to put an

artistic background or a company logo behind your charts. When overlaying two graphs, however, make certain that all the legends match. When I tried to overlay two graphs, one live and one saved, the result was what the manual called "con-

---

**A***FTER A GRAPH  
or any other screen is  
saved, it can be recalled  
and overlaid on another  
screen.*

---

fusing." To me, it looked like a mess. Obviously, Fast Graphs stores the entire screen graphically, without trying to make any sense of the information it presents.

My next encounter with disaster came when I tried to recall the saved screen: the on-screen prompt I had received previous-

ly, "load drive B," was glaring up at me from the bottom of the graph.

### The Printed Graph

The print mode allows your choice of a limited number of printers. At the top of the list is the IBM dot matrix printer. Fortunately, my dealer graciously managed to supply me with a brand new one. Using both the printer and the program straight from the box, however, resulted in unsatisfactory graphs. The printer, expecting words rather than pictures, added blank space between the lines. In other words, I kept receiving a double line feed command. The resulting graphs were marred by elongated circles and badly broken bars. No doubt with a little tinkering, everything can be patched; at least that's what the dealer and I assumed. After nearly an hour of dissection, screwdrivers, and headscratching, we decided it would be easier to use a different printer.

When I brought the problem to the manufacturer's attention, a representative told me that revisions of Fast Graphs—

micro

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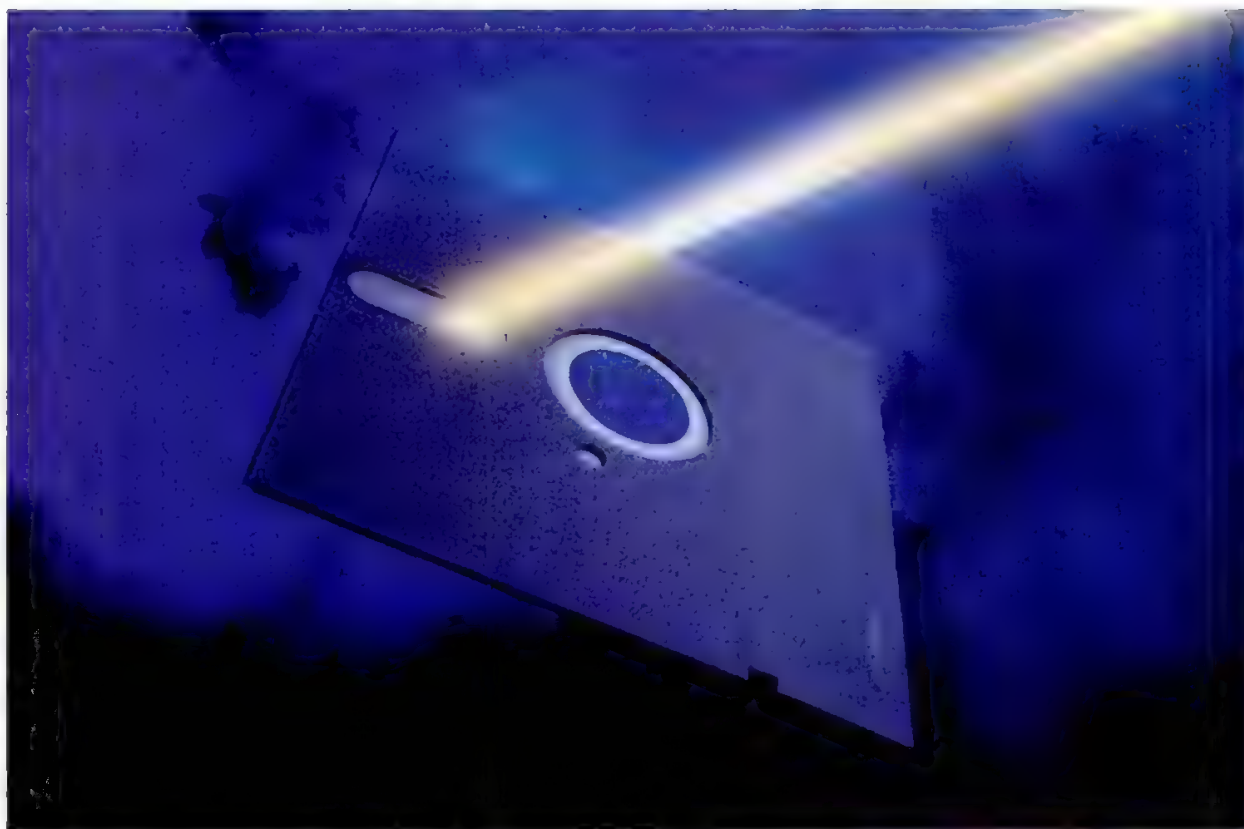
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PC MAGAZINE 280 JUNE 1983



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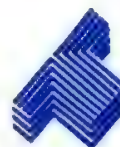
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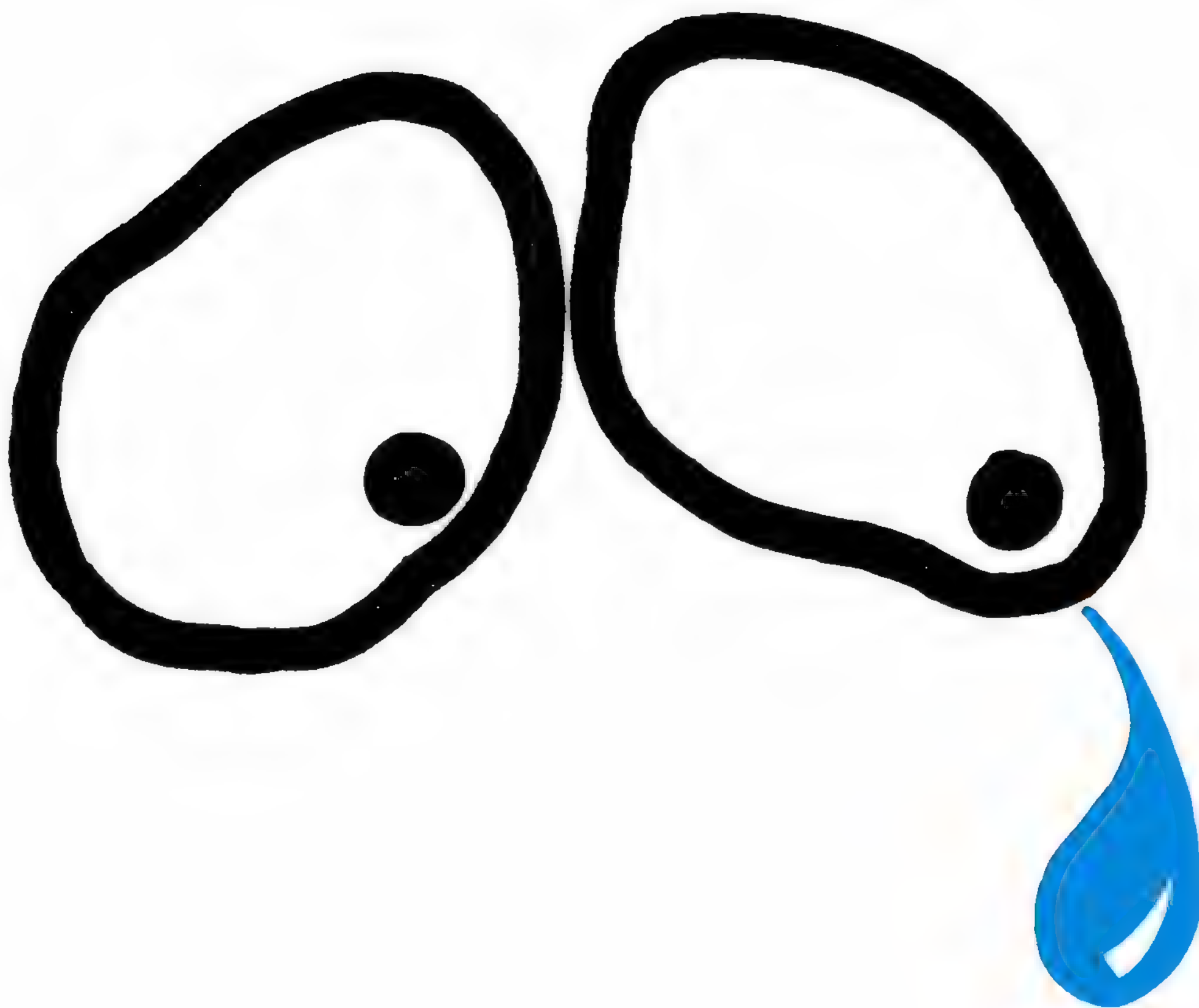
TurboFile is currently available for the IBM Personal Computer, and is priced at \$195. For additional information call Creative Computer Applications, Inc. (603) 888-6648, or write PO Box 7074, Nashua, NH 03060. We're the ones who wrote VisiFile.

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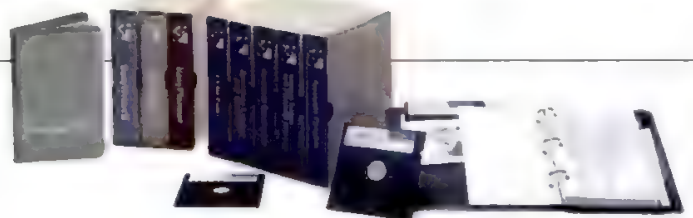
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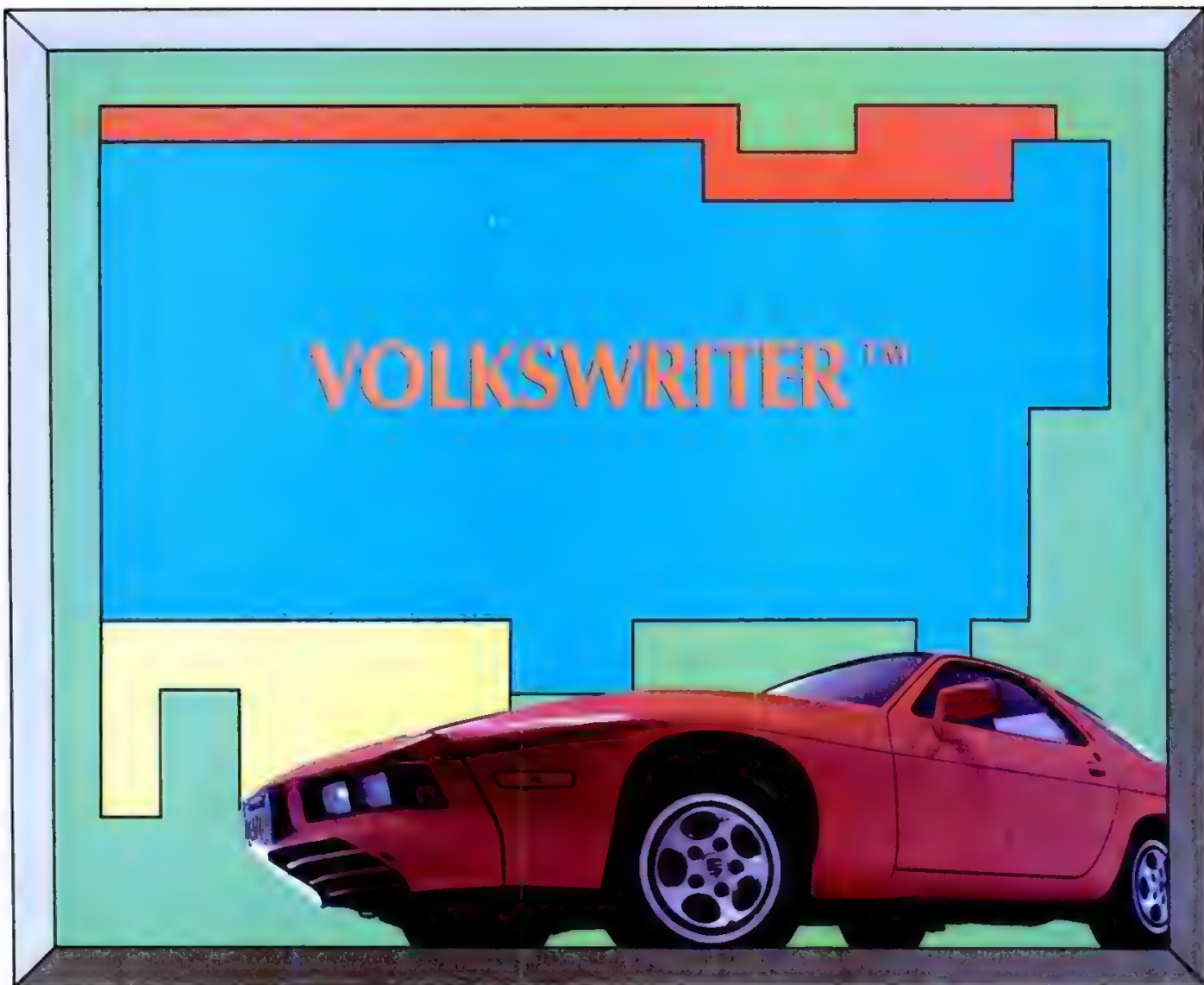


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those after 1.1—have been corrected to run properly on the new printer.

You can obtain print-outs in three sizes (7.5 × 10 inches, 5 × 7 inches, and 2.5 × 3.5 inches) by using any compatible printer except the IBM dot matrix.

The printers and plotters with which Fast Graphs 1.0 claims to be compatible include Amdek DXY-100, Hewlett-Packard 7470A, Hi-Plot single- and multi-pen, and Integral Data Systems Prism. Version 1.1 adds the Strobe 100, Okidata 84, and Panasonic VP-6801A to the list. With an appropriate plotter, Fast Graphs can put color in your hard copies.

### The Final Adventure

After discussing my Fast Graphs 1.0 problems with the manufacturer, it sent me version 1.1—or rather, the part of it that will be available by the time you read this. As noted above, the new revision features more compatible data formats and can be used with more printers. It also prints and plots faster. Running a large, three-color, 3-D bar chart on a Hewlett-Packard 7470A printer only takes about 30 minutes with version 1.1. The older version takes about 50 percent longer. The IBM graphic printer only takes a few minutes to make a black-and-white copy of the same chart. The version I received, however, was not the final one that is now available, and had not corrected the double line feed problem.

Next, I borrowed one of the sample files from Fast Graphs to experiment with its plotting function. When I saved the file on a two-drive PC, no extra prompts appeared, but I forgot about the message that the writers of Fast Graphs had added to assure users that they had done a good job. The legend "This looks great" appeared mysteriously in my plot (See Figure 1).

I also observed that the creators of Fast Graphs have a good sense of humor. Every time the H-P plotter made a dot on the paper, the corresponding dot disappeared from the monitor screen. Fascinating!

### Slide Show

Version 1.1 also features a slide show presentation. Fast Graphs can be programmed to run through a series of charts in any order, displaying each chart for a selected length of time. It can also be programmed to run through the whole show repeatedly.

Unfortunately, I received the new program before the manual was revised, and spent a great deal of time trying to deter-

***FAST GRAPHS  
can be programmed to  
run through a series of  
charts in any order,  
displaying each chart  
for a selected length of  
time.***

mine how the show works. I hope the new manual, which will soon be released, will provide a good roadmap.

One final note. BASRUN.EXE, a file necessary for the execution of Fast Graphs, was not included in the revised version I received. I was told that the omission was inadvertent in that I had

received a "special rush copy." I was assured that the file will be included on all distributed copies. Surprisingly, although the disk I received has only 25K of disk space available, BASRUN.EXE takes up 31K. I'm sure the company's programming geniuses will find a solution.

If you already have an earlier version of Fast Graphs and you want to receive all its new features, return your old disks to Innovative Software with an update fee of \$20, and you'll receive the latest edition.

Fast Graphs is, indeed, a fast and easy way to get color graphics on your PC screen. You can have fun with it or work with it. The biggest deficiency in the program is insufficient documentation.

After you've worked (or played) with Fast Graphs for a while, you will discover a quick and colorful means of changing your most routine numerical calculations into sparkling charts and graphs. Even if your graphs turn out to be less than exciting, they will still make your data much more approachable than an endless stream of gray or green-on-the-screen numbers. /PC

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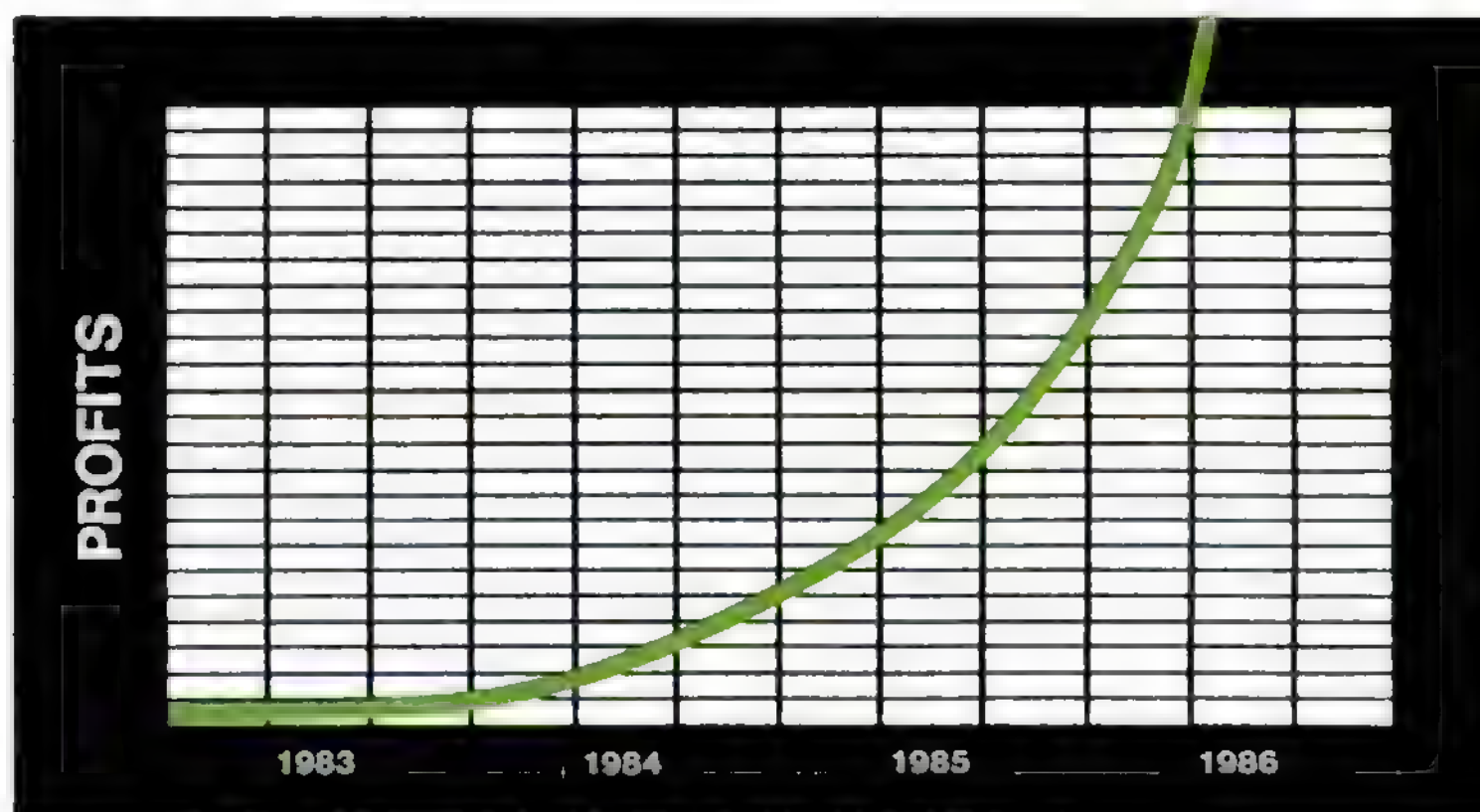
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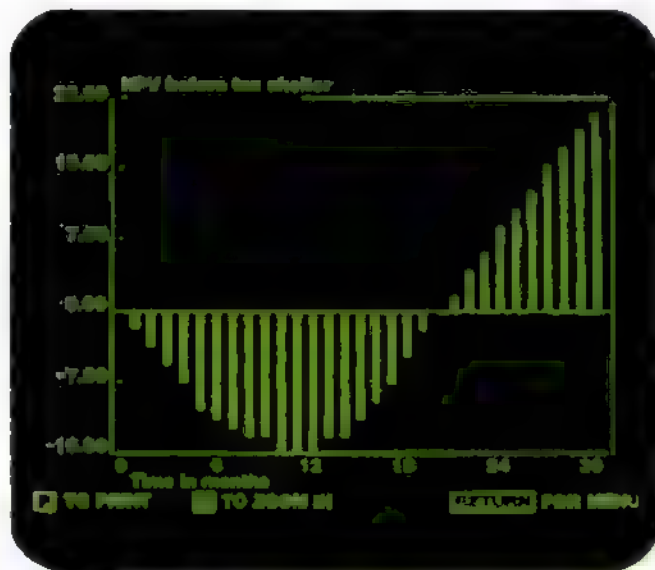


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When it's important to share your ideas with others—business associates, clients, and friends—and words alone do not suffice, graphics may make the difference. With the latest computer plotters you can create superlative graphic representations of anything from a droop in dirigible sales to the floor plan of your neighborhood bank, all in clever little bars, pie slices, and isometric drawings. However, your associates and accomplices may operate from different parts of the country—from marketing capitals like New York to vacation retreats like Leavenworth. Somehow you've got to get a copy of the vivid 16-color picture on your IBM PC monitor screen to each of them. Your colorful data are useless locked within the confines of your Personal Computer. You need to present your information in hard copy, a graphic printout.

Essentially you have three alternatives: a camera, a printer, or a plotter. The camera is the straightforward answer; just take a picture of the screen. But then you've got to put up with the delay of processing (or the small size of Polaroid prints), not to mention the inevitable cost. Printers can only give you a rough representation of graphic ideas, and very often the coarseness of the quality gets in the way of communication. When the goal is a graphic aid to present at a business gathering, you often need a transparency for overhead projection. Converting photographs or printed graphics to transparencies can be a time-consuming process at best.

Of all the possible choices, plotters speak the language of graphics most clearly, expeditiously, and inexpensively. While printers communicate only in small pieces and in individual characters, sift-



The Hewlett-Packard 7470A Plotter.

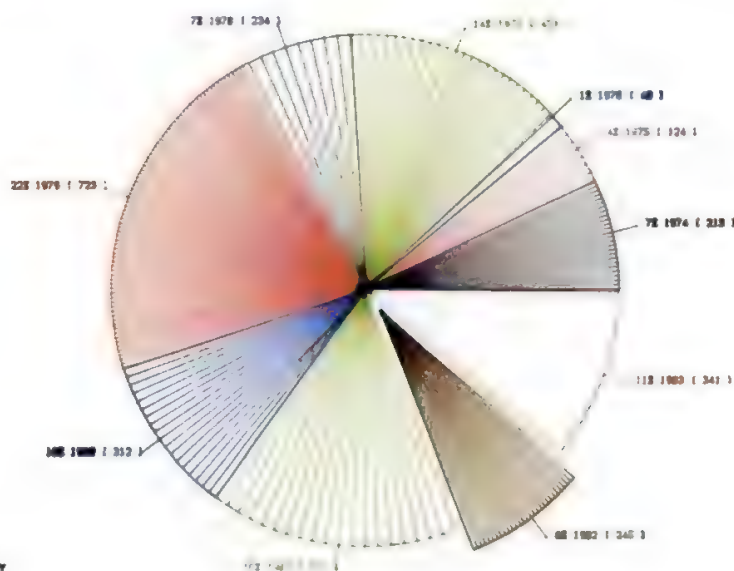




Figure 1: Printout from HiPlot DMP-40 plotter showing line-, bar- and pie-chart features.

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MILLIONS



TEMPLATE - DUMMY  
DATA - DUMMY  
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Figure 2: Printout from HiPlot illustrating pie-chart capabilities (dummy data).

ing your thoughts through a sieve of dots and dashes, a plotter draws a picture with lines the same way you would. Like you, plotters use pens instead of daisy wheels, thimbles, and hammers. Plotters can

## THE PURPOSE of a plotter is to automate your hand.

wield a pen with sweeps and flourishes, drawing anything from the jagged angles of modern architectural drawings to the undulating flow of Spencerian script.

The purpose of a plotter is to automate your hand. In so doing, it can create anything that you can draw—graphs, charts, drawings, layouts, transparencies, etc. And it can probably draw them faster and clearer—particularly if your native gift is analysis rather than art.

### Putting Pen to Paper

The obvious way of getting your computer to mimic the human drawing process is to copy the motions of an artist's or draftsman's hand by using a mechanical hand to move a pen in all directions across a stationary piece of paper. A number of graphic plotters have been built around this elementary concept. Because the pen movements are in two dimensions, corresponding to X- and Y-axes, such plotters are called "X-Y plotters."

Although X-Y plotters can produce almost perfect drawings, relatively few have attached themselves to personal computers. The mechanism required for the X-Y motions of the pen are extremely complex, which is to say costly. Too, the pen-moving mechanism is inevitably rather heavy, massive, or both. Since the time of Newton, mass has been the enemy of speedy changes of direction. A greater force is required to change the course of a more massive object (a truck is harder to turn than a sports car). Greater mass means that more powerful machinery is required to control the heavier mechanism—which, in the end, again translates into higher cost.

But computers don't have to think like people, and they don't have to draw like people. A new generation of plotters has



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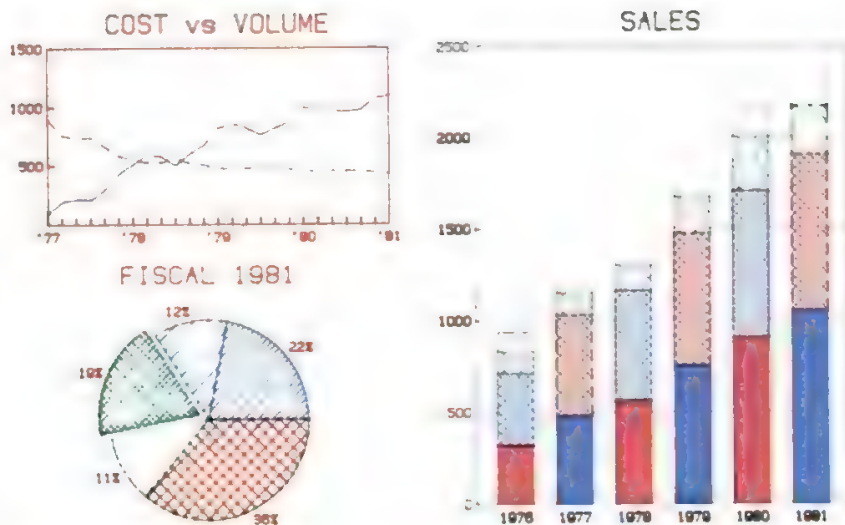


Figure 3: Printout from H-P 7470A Plotter illustrating line-, bar-, and pie-charting capabilities.



Figure 4: Design created on H-P 7470A Graphics Plotter.



Figure 5: A map of the United States drawn on H-P 7470A Graphics Plotter.

grown from this simple flash of insight. Although mere human beings draw best when they firmly anchor their paper in place, computerized plotters need not limit themselves to such conventions. In fact, a plotter can reverse the norm by holding the pen steady and moving the paper. Clever as the idea sounds, no plotter is designed as a two-dimensional paper-mover because a plotter so designed would have to be a complex mechanism, too, and would present many of the same disadvantages of an X-Y pen-mover.

A compromise, however, turns out to be a vastly simpler solution—move the paper in one direction and the pen in another. When a flyweight sheet of paper is shifted rather than a bulky plastic and metal mechanism, the mass to be moved becomes minuscule, the pen- and paper-moving mechanisms become simpler, and prices plummet—almost to the point at which there can be a plotter in every pot, or at least connected to every PC.

### Two Approaches to Plotting

Two plotters, the Hewlett-Packard (H-P) 7470A and Houston Instruments' Hi-Plot DMP-40, are among those that translate this design concept into reality. Though priced well below most X-Y plotters (\$1,575 and \$995, respectively), both machines are built in the United States by companies famed for precision instrumentation (Houston Instruments is a division of Bausch & Lomb). Either of the two-some is capable of quickly drawing multi-colored charts and graphs on either paper or acetate with smooth strokes that come closer to the work of a draftsman's hand than to the output of an electronic number cruncher. Together they exemplify the latest generation of high-quality and (relatively) low-cost graphic plotters.

Although both machines approach the plotting problem from the same direction—by manipulating both pen and paper—each uses different technologies and philosophies to produce results.

Making the paper move creates some problems while eliminating others. With the familiar X-Y plotters, paper slippage is rarely a worry. Their sturdily-constructed mechanical arms are locked into precision tracks and do not easily slide out of adjustment. The mechanical integrity of the system assures that the plotter will never lose its place on the paper. Moving paper on the new plotters, however, could be sub-



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ject to slippage. As the sheet spins back and forth, it might slide slightly out of registration, sneaking a little way off from where the plotter expects it to be. And whenever the paper (or pen) is not precisely where the plotter expects it to be,

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## **I**N BOTH *plotters, the low mass of the moving paper permits very high plotting speeds.*

---

the result is misregistration—lines don't match up, outlines become bleary, and graphs become ragged. Both the Houston Instruments and Hewlett-Packard plotters avoid this misregistration problem by locking the paper between two sets of rollers.

The HiPlot DMP-40 is a drum plotter. To insure against slippage, the DMP-40 uses a long metal drum that has an inch or so of the surface near both ends knurled. (This drum is not very wide—in the vicinity of an inch. I would call it a tube or a rod rather than a drum.) Pressure from two rubber pucks squeezes the paper against the knurl and impresses a faint pattern into the sheet. The embossed pattern in the paper locks itself into the knurl in much the same way two gears lock together. The paper cannot slip. Although the pattern that is pressed into the paper is visible (and discernible by touch) on the finished plot, it's not objectionable.

The Hewlett-Packard 7470A uses "micro-grip drive," which locks each edge of the plotting paper between a small beveled plastic pinch wheel and a metal drive wheel with a coarse sandpaper-like metal-grit surface. The rough, sharp particles on the drive wheels penetrate the surface of the paper to create thousands of tiny indentations (invisible to the naked eye) that serve the same function as the pattern pressed into the paper by the knurls on the drum of the DMP-40. As the paper makes subsequent passes through the plotter, each indentation aligns itself with the same grit particle that created it.

In both plotters, the low mass of the

moving paper permits very high plotting speeds. This means that they can quickly translate computer commands into finished charts. The ultimate limit to speed is determined by the type and construction of the mechanism that actually moves the paper and the pen. H-P and Houston Instruments have adopted different technical approaches to this mechanism.

### **Motor Power**

The H-P 7470A uses direct current (DC) motors to position both pen and paper. Attached to each motor is an optical position sensor that tells the circuitry inside the plotter exactly where the pen or paper is located. The positioning mechanism is "servo-controlled," which means that each motor is programmed to move the paper (or pen) until it reaches exactly the right position; then it is held precisely in place.

The Houston Instruments DMP-40 uses stepper motors to move both pen and paper. A stepper motor is designed to move the pen (or paper) one increment—or "step"—each time it receives a control pulse. By varying the number of control pulses sent to the motor, it can locate pen or paper anywhere within the limits of its travel. Although the stepper motor cannot sense the actual position of the pen or paper, a microprocessor system built into the plotter remembers how many pulses have been sent. From that information it can determine the position of each part of the system.

Although servo-control mechanisms are usually more complex and costly than stepper-motor-operated systems, they are also faster. According to the manufacturers' specifications, the H-P 7470A can draw lines over five times faster than the DMP-40, all else being equal—which it rarely is. Positioning speed is only one of many factors in determining the speed of making a plot.

### **Pen Control**

According to Daniel Kuehler, a Hewlett-Packard sales support engineer, the big breakthrough of the 7470A is its pen-damping mechanism, which gently lowers the pen tip to the drawing medium. By preventing the pen from smashing down onto the paper, the life of the fiber-tipped pens is greatly increased. This pen-damping mechanism on the H-P requires no adjustment of the pen pressure on the

paper—nor provides for any.

Being naturally curious, I decided to see what mechanical tricks made up this wondrous mechanism. After removing the cover of the 7470A, a quick visual inspection of the mechanism revealed a spring between the activating solenoid and the arm that controlled the pen. I then removed the end cover from the Houston Instruments DMP-40 and discovered that its actuator for lowering the pen to paper is coupled to the drawing mechanism by a piece of cord, a clever shock absorber in its own right. Further observation revealed the probable reason that the H-P 7470A requires no pen pressure adjustment: A narrow channel is molded into the bed below the area of the paper upon which the pen draws. The pen pushes down against nothing but the stiffness of the paper, while the pens of the DMP-40 press the paper against a rotating stainless-steel drum. The DMP-40 pen-pressure adjustment is controlled by a single screw. You simply adjust the force so that the pen doesn't skip or press too hard.

Although it would appear that the difference in the drawing quality of the two plotters would be as dramatic as between writing on a sheet of paper atop a stack of soft newspapers and writing on a sheet backed by a hard desktop, to my eye the

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## **B**OTH PLOTTERS *have microprocessors in residence to take a load off your computer.*

---

pen strokes by both plotters looked the same. The two approaches are just different ways of getting to the same end.

### **Feeling out the Soft Parts**

Both the H-P 7470A and the HiPlot DMP-40 are intelligent devices ("damn near brilliant," according to Houston Instruments' marketing/communication manager, John Williams). Both plotters have microprocessors in residence to take a load off your computer, feature complete character sets in on-board read-only-memory (ROM), and understand sophisticated graphic languages that are accessi-



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ble through IBM BASIC.

The Hewlett-Packard understands HP-GL, Hewlett-Packard Graphics Language. The HiPlot DMP-40 understands DM/PL III, Digital Micro/Plotter Language. This means that within 10 minutes of connecting up either plotter to your IBM PC you can be drawing simple figures like circles, squares, and alphabets. If, however, you're an applications-oriented user, you probably won't want to bother with the primitive commands that these graphic languages offer you. These languages are nevertheless important to you. Because both languages are well known (DM/PL

predecessors have been in use for more than a decade), many applications software packages incorporate them. That means that both plotters are compatible with over a dozen different software packages. Although given enough time for evaluation and a suitable coin to toss, it might be possible to conclude which of the two languages is best, for the average user the differences won't matter.

If you want to program either plotter through BASIC, both manuals will delight you. Each explains the complete commands set and offers simple example programs. Unfortunately, you'll have to cope

with the dialect differences between various versions of BASIC when exploring the programming capabilities. (Hardly an insurmountable task, but a rude awakening if you think the language your IBM computer speaks is somehow holy.) Hewlett-

**T**HE LEVERS  
that lower the pressure  
rollers do not inspire  
great faith.

Packard assumes, for instance, that you own an H-P computer. What blasphemy!

Either plotter, when suitably equipped with options, can function as a graphic digitizer. Rather than moving its pen where your computer tells it to, it will tell your computer where its pen is.

#### High Points of the HiPlot

The Houston Instruments DMP-40 operates on 14 volts, supplied by a hefty black transformer (included with the plotter) that plugs directly into an electrical outlet. A jack on the back of the plotter accepts the approximately 6-foot-long cord that slithers out of the transformer. On the unit I tested the grounding pin on the transformer was bent—no big problem. I unbent it with pliers and plugged it in.

A tiny toggle switch on the back of the DMP-40 turns it on. One or more light-emitting diodes (LEDs) on the membrane-switch front control panel illuminate during operation (depending on the functions selected) to assure that the unit is receiving power.

Loading paper with the HiPlot seems to be a relatively simple chore. A small plastic arm on either side of the plotting area lifts the rubber pucks off the knurled drums to permit any variety of paper or other drafting material (like acetate) to be slipped into place. A double white line on the left side indicates the proper position for the side of the plotting material, and the front edge of the plotter indicates the end of the paper. There are no mechanical stops to aid in positioning the paper.

The levers that lower the pressure rollers do not inspire great faith. They are rather slender and flexible, approaching flimsy—a great contrast to the otherwise

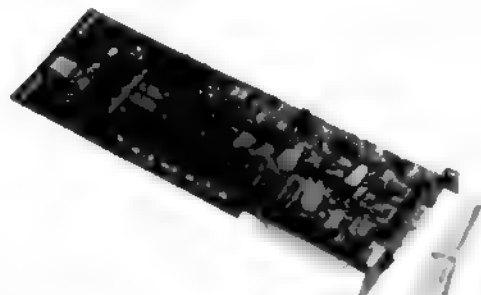
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robust, mostly-cast-and-machined construction of the rest of the plotter.

The first time I tried loading, I inadvertently used the back edge of the plotter to position the paper. When the DMP-40 was turned on, it promptly rolled the sheet onto the floor.

Paper size, communications baud rate, and various other functions are set manually using the 12-membrane switch push-buttons on the right side of the front of the plotter. Then, the plotter rolls the paper back and forth through its mechanism to emboss the nonslip pattern into the paper. However, if a small sheet is used and the

"large" switch is depressed, the sheet is rather unceremoniously rolled onto the floor. Although a bit bothersome, it also assures that you don't try to plot on too small a sheet.

Various sorts of pens can be easily snapped into the holder, including hard nib/fiber tip pens, ballpoints, and Rapidographs (drafting pens). Although only one pen can be installed at a time, multicolored plots can easily be drawn with an appropriate program. The control software for the plotter includes a pause command to allow for the manual switching of pens. No pen sensor is included in the

plotter's design, so the plotter has no idea whether you've mounted a pen or not. It will quite happily run through all the motions of plotting completely penless without leaving a trace.

Pressing two of the membrane control switches (the up arrow and the down arrow) at the same time elicits a self-test program. The plotter races through a demonstration chart that illustrates some of the plotter's capabilities and assures that all is well.

The DMP-40 uses a standard RS-232-C

**I**F A SMALL sheet is used and the "large" switch is depressed, the sheet is rather unceremoniously rolled onto the floor.

serial interface. With the software supplied to me for demonstration purposes, a particular interconnection cable was required to mate the plotter to the PC. Neither this cable nor any other interfacing cable is supplied as standard equipment with the plotter.

Other applications software packages may require their own variety of cable connections. Although interconnection instructions are given in the plotter's instruction manual, they are for the more technically inclined. Most software that supports this plotter includes instructions for making the proper connections.

I loaded the demonstration software into a PC and tried to run it without referring to the manual, which required learning a new language (somewhere between English and gibberish). I had to be tutored by the software author to fill in all the blanks to draw a proper chart. Even so, the plotter refused to plot—or do anything at all—on my first attempt.

The DMP-40, equipped with its standard RS-232 interface, can communicate at various baud rates, which are selected either by the front panel switches or automatically. In automatic mode, however, the plotter could not automatically decipher the baud rate used by the demonstration software. In retrospect, it appears to



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***T***HE PLOTTER  
hummed and pecked  
along, like a happy  
cross between  
bumblebee and  
woodpecker.

have been a problem with the software, not the plotter itself. The machine finally came to life when I manually advised the DMP-40 how fast the IBM PC was chattering to it by pressing the appropriate commands into its front panel switches.

Once running, it was obvious that the DMP-40 works as advertised, drawing a complete chart in a few minutes. Staircasing, the jaggedness of supposedly smooth curves and diagonals drawn by computer, was not apparent. The plotter hummed and pecked along, like a happy cross between bumblebee and woodpecker.

Unfortunately, the demonstration software did not work as well as the plotter itself. It refused to accept data to draw any sort of plot except pie charts. When I tried a second chart, the software lost track of where the paper was, and the plotter rolled it off onto the floor. (I was getting tired of stooping over to pick sheets up off the floor.) Because the DMP-40 has no sensor to warn of the missing sheet, it plotted an entire chart on its metal drum.

Houston Instruments advised me that the plotter gives the operator a visual indication of its paperless condition: All the user has to do is look at it and note the paper drifting slowly to the floor. (See Figures 1 and 2 for samples from the HiPlot DMP-40 plotter.)

**The H-P 7470A and a Comparison**

The Hewlett-Packard 7470A is totally self-contained and requires no outboard power transformer. It simply plugs in. Flicking a rocker switch on its rear panel brings it to life.

When the plotter is equipped with the "001" serial interface option, connecting

it to the IBM PC is relatively simple. Hewlett-Packard supplies a special cable to connect the 7470A to an IBM PC serial port (\$50). The only problem I had with the interconnection was the illegible DIP switch settings shown on the instruction sheet that accompanied the demonstration software.

Loading paper on the 7470A is a simple chore. With a single lever the paper is easily positioned against two edge stops. You can load the paper with only one hand. (The HiPlot DMP-40, with only its white lines for guidance, takes two.) I preferred the more convenient H-P scheme.

Front-panel controls of the H-P plotter are small pushbutton tabs on a nearly horizontal surface. Manually-selectable functions include many of those available on the DMP-40—with the exception of baud-rate selection and paper-size selection, which on the 7470A are handled by a DIP switch on the back panel.

While the 7470A handles two paper sizes, there is only a few millimeters difference between them. One is an English system standard, the other is a metric standard. While the HiPlot DMP-40 permits the use of almost any drafting medium from newsprint to vellum, the H-P is more particular. H-P recommends only one variety of drafting paper and special paper-backed acetate for transparencies (sold by H-P, of course). Through a combination of experimentation and not reading the manual, I found that normal bond paper stolen from the resident Xerox machine actually gave better results than H-P's plotting paper, at least to my eye!

***T***HE HILOT  
DMP-40 permits the use  
of almost any drafting  
medium from newsprint  
to vellum.

The manual paper/pen positioning controls on the H-P are labeled a bit more logically (for some reason I kept getting the "up" and "down" controls on the HiPlot confused) and seem easier to use because they give real tactile feedback. On both machines these controls are used pri-

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marily for varying the size and aspect ratios of plots and positioning them on the drawing medium. Pressing the wrong button is inconvenient but hardly fatal.

On the H-P, manual paper/pen positioning speed is increased four times by pressing an additional button in the center of a cross-shaped array of controls. Under manual control, the paper/pen moves slowly for the first few seconds, then switches into high gear automatically. Until you get the hang of pecking at the pushbuttons, precisely locating the pen on the paper can be—well, imprecise. Both plotters have controls for raising and lowering the pen to and from the paper.

The H-P permits two functions not found on the HiPlot. One button temporarily halts plotting and rolls the paper forward for you to check its progress or to admire your computerized handiwork. Pressing it again continues the plot. Two other buttons allow you to switch between the two pens mounted in the plotter while the plot is in progress. All push-button functions on the 7470A take priority over software commands, so you can manually change pens in midplot and lift or lower the pen while it's making its excursion across your drawing.

The HiPlot DMP-40 only allows one pen to be mounted at a time. Houston Instruments recommends removing the pen from the plotter and capping it after each plotting session.

**ALL  
push-button functions  
on the 7470A take  
priority over software  
commands.**

The Hewlett-Packard 7470A permits the installation of any two pens at a time. When they are not actually being used for drawing, the pens are stored in two stalls, one on either side of the plotting area. Each stall has a clever automatic capping mechanism that covers the pen tip and prevents it from drying out when not used for extended periods. A hinged, smoked plastic cover protects the drawing mechanism of the H-P plotter. The HiPlot leaves

everything out in the open.

I discovered that the 7470A is a rather clever device and is difficult to outsmart even though the pen stalls have no sensors to indicate whether a pen is indeed present. Should you move the extra pen from one side to another while the other pen is being used, the plotter figures out

**THE PLOTTER  
refuses to damage itself  
by ramming a pen into  
an already full stall.**

your malfeasance and accepts the changed condition without trying to ram one pen into an already-full stall. If you fill both stalls while a third pen is being used for plotting, you've only fooled yourself. Again, the plotter refuses to damage itself by ramming a pen into an already full stall; it just keeps going without changing pens. The only condition with which it has difficulty coping is no pens at all, in which case it makes a penless plot.

The 7470A seems designed to handle any problem without flinching—or destroying itself. I tried to make it lose its place by forcefully pulling the mechanism away from its predestined course, a simulation of a very bad jam. The tiny servo motors struggled against my pull. I finally won, breaking them free from subservience to their servo loops. Instead of continuing with a distorted plot, the machine shut down and flashed its error light at me. Turning the power off and back on restored it to working condition with no discernable damage.

In fact, for me, the H-P 7470A was a frustrating machine. Virtually nothing I could do would ruffle its dignity. Only by forcefully yanking the paper during a plot could I force it to make an unacceptable drawing. Nor did it ever spew its paper onto the floor. (See Figures 3-5 for samples of H-P 7470A output.)

The stepper motors of the HiPlot DMP-40 react quite differently to abuse. They are of such robust design that nothing, at least nothing reasonable, will stop them. When I somehow programmed the luckless machine into trying to draw not only



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off the paper but beyond the machine's mechanical limits, it graciously pulled its pen hard starboard and snapped off the arm holding it, then growled at me rather ominously. Fortunately, turning off the power calmed the angry beast, and turning the power back on restored normal operation. The pen holder snapped back into place without a problem.

### Picking a Plotter

Although more plotters based on the moving-pen-and-moving-paper design concept are becoming available, a discussion of the relative merits of the Hewlett-Packard 7470A and Houston Instruments' HiPlot DMP-40 will illustrate the points to consider when buying any plotter.

After eyeing the two machines, the obvious question is, "What does an extra \$500-odd dollars (for an H-P 7470A) buy?" After all, both plotters have similar capabilities. Although they speak different languages, either tongue is capable of producing excellent graphics. Both are very intelligent; both have onboard microprocessors and sophisticated resident firmware (character sets and high-level commands). The answer is threefold—convenience, accuracy, and speed.

The two-pen capability of the 7470A reduces the necessity of changing pens often. It may mean that your plotter can be making plots while you're watering the plants at home or watering the stock at work. You don't have to hover like a vulture over the machine with one eye glued to the display screen, waiting for the appropriate prompt to change pens. The automatic pen capping feature of the 7470A means you might never have to bother removing pens from the machine.

The servo-drive mechanism of the 7470A means that you might turn out plots at much higher speed. At full throttle, its pens will dash across paper five times faster than those of the DMP-40. The precise servo-drive mechanism may also provide about five times better resolution, which should result in sharper graphs.

However, most of these benefits are theoretical. Tempering them with reality significantly alters the balance between the plotters.

In reality, the speed difference dwindles because the specified plotter speed is only one of many factors in actual plotting speed. For instance, the 7470A must be slowed considerably from its 15-inch-per-

## Deciphering Specifications

*An examination of the factors involved in determining the quality of plotter-generated charts*

### Deciphering Specifications

The quality of the charts drawn by any plotter is determined by several factors that are related to the construction and operation of each particular plotter design. These factors are defined by several specifications.

#### Resolution

Resolution is important since it indicates how smooth the lines and curves that a plotter draws can be. When a plotter tries to draw a line that is not parallel to either the X- or Y-axis, it can only approximate it with a series of steps. This effect results in diagonal lines that look like stairsteps. Hence, it is sometimes called "staircasing." Because both the pen-moving motor and the paper-moving motor operate at the same time, plotters approximate off-axis lines and curves in 45° steps. (See Figure 6.) The higher the resolution of the system, the finer the stairsteps, and the smoother the resulting lines.

By its very design, a stepper motor moves the pen or paper in series of these finite-length steps. Similarly, the optical position indicator on the servo motor of the H-P 7470A is divided into segments or steps to provide digital information about the location of pen and paper. In either case, these steps determine the resolution of the plotter's drawing capabilities. The finest detail that a stepper motor system is capable of drawing is limited by the size of an individual step. The finest detail that a servo-motor-controlled system is capable of drawing is limited by the smallest position the optical indicator can resolve.

#### Accuracy

The accuracy of a plotter refers to how well it can find a given point on a sheet of paper from the directions given to it by the program that controls it. Because the paper is locked into place by the pinch roller/drive wheel mechanism, and the moving mechanisms are locked in sync by the stepper or servo mechanisms, the accuracy of both the plotters under review is close or equal to the resolution.

#### Repeatability

Repeatability is a measure of how precisely the plotter can find the same place on a given graph after venturing somewhere far afield. In other words, it is a measure of how well the plotter can draw one line on top of another. It is an important consideration when drawing multi-colored charts. The better the repeatability, the nearer to colinear two different colored segments of one line will be. Better repeatability is indicated by a smaller number (see Plotter Comparison Chart).

#### Addressability

No matter how good the mechanical parts of a plotter, the quality of a chart is limited by how precise its instructions are—that is, the fineness of detail that can be described by the language that controls the plotter. Each point on a chart can be assigned an "address" much like memory addresses inside a computer. The smaller the location assigned to each address, the finer the detail that can be described. The specification that describes the size of each address is called addressability. Note that both plotters under review have addressability equal to or finer than their resolution. The mechanisms are the ultimate determining factor in the precision capability of each plotter. —WLR

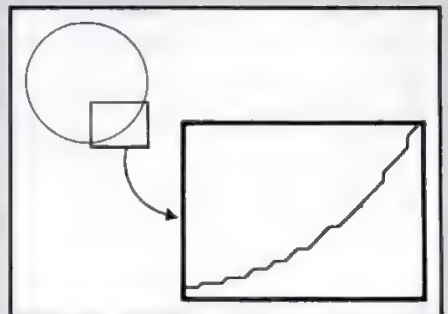


Figure 6: "Staircasing" or "stairstepping" results from the digital, incremental nature of plotters. On close inspection, curves and diagonals can be seen to consist of short line segments. Magnified view shows lines drawn parallel to X or Y axis; lines off axis are drawn at 45° angles to horizontal or vertical plane.



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**Plotter Comparison Chart**

Specification	Houston Instruments HiPlot DMP-40	Hewlett-Packard 7470A
<b>Paper size:</b>	8.5 × 11 inches (DIN A4 standard)  11 × 17 inches (DIN A3 standard)	8.5 × 11 inches (ANSI A standard)  210 × 297 millimeters (ISO A4 standard)
<b>Plot area:</b>	7 × 9.25 inches  9.25 × 15 inches	7.5 × 10.2 inches (English setting)  190 × 273 millimeters (metric setting)
<b>Resolution:</b>	0.005 inches	0.001 inches
<b>Addressability:</b>	0.001 inches	0.001 inches
<b>Repeatability: (with same pen)</b>	0.005 inches	0.004 inches
<b>Pens, number:</b>	1	2 (automatic change)
<b>Pens, type:</b>	Fiber tip Ball point Rapidograph (drafting)	Fiber tip
<b>Maximum pen speed:</b>	3 inches per second (parallel to either axis) 4.2 inches per second (diagonally)	15 inches per second
<b>Motors:</b>	Stepping motors	DC servo motors
<b>Power consumption:</b>	55 watts	25 watts
<b>FCC Certification:</b>	Class B (pending)	Class B
<b>Size (H × W × D)</b>	4.4 × 21.2 × 8 inches	5 × 17 × 13.5 inches
<b>Weight</b>	10.5 pounds	13.5 pounds
<b>Interface:</b>	RS-232	RS-232 HP-1B (IEEE-488)
<b>Programming Language:</b>	DM/PL III	HP-GL
<b>Compatible software: (not an inclusive list)</b>	BPS Business Graphics (Bus. & Prof. Software) Business Graphics System (Peachtree) BuzPlot (Data Most) Calligraphy (Data Most) Curve II (West Coast Consultants) Data Digitizing System (C-J Sales) Higraph I (Micrographics User Group) Micrograph (Cosmos Software) Peachtree Graphics Language Three-D Mapping System (C-J Sales) Fast Graphs	Boardroom Graphics (Analytical Software, Inc.) BPS Business Graphics Business Graphics Systems (Peachtree) Chartmaster (Decision Resources) Giraph (Data Display) GraphPower (Ferox Microsystems) GrafTalk (Redding Group) Graphwriter (Graphic Communications) pfs: Graph (Software Publishing Co.) Fast Graphs (Innovative Software)

second top speed when plotting transparencies. Moreover, the most common limit on speed is in the software. If the software you choose to run your plotter does not command the machinery efficiently, a great deal of time may be wasted. One software package I tried took about a half hour to plot a single bar chart on the 7470A. The demonstration program from Hewlett-Packard took less than 10 minutes to draw a similar graph. Although I was unable to make a direct comparison by running both plotters with the same software package, it's easy to see that the difference in plotting speed between the two units might not be as significant as the simple specifications imply.

Similarly, the difference in the accuracy of the two plotters, although apparent in the chart of specifications, may not be apparent to the eye. The resolution shown on the specifications chart is again the ultimate theoretical limit. In reality, several factors serve to lower the resolution. The width of pen tips is greater than the ultimate resolution of either plotter. It has to be if portions of any plot are to be filled in with solid color. The wide lines can obscure the finest moves of the highly-accurate positioning mechanisms. Many software packages do not exploit the ultimate capabilities of either plotter. Both the Hewlett-Packard and Houston Instruments plotters can produce charts without apparent "staircasing," but both may produce charts that resemble fire escapes when using some software packages.

Nor can the H-P 7470A claim all the advantages. The DMP-40 handles charts twice as big as the H-P. And the DMP-40 boasts a wider variety of pen styles and utilizes a greater variety of drawing media than the 7470A.

Although both plotters are precision instruments, the H-P exudes a certain delicate quality. The HiPlot seems to be much more robust. It uses bigger motors and heavy-machined castings rather than stamped pieces.

Unless you plan to write your own graphics programs, the biggest consideration you'll face in choosing a plotter is software. Instead of choosing a software package to match your plotter, you may be happier choosing a plotter to match the software package that gives the results—accuracy, speed, convenience, graph and chart styles, and drawing capabilities—that you want and need.

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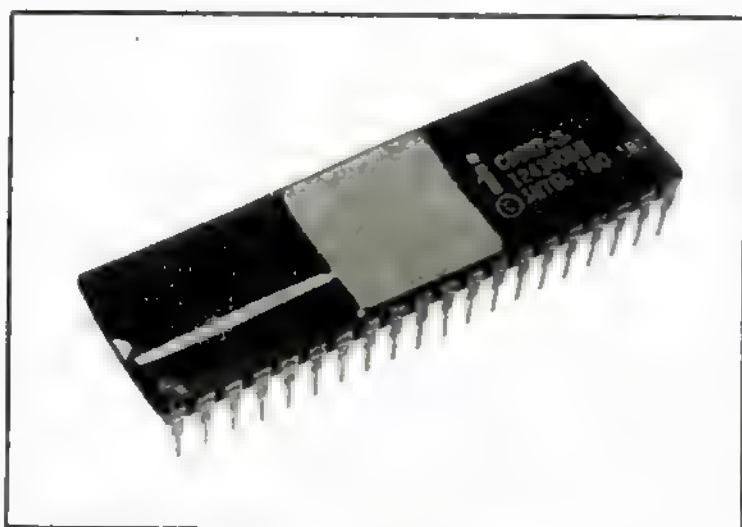


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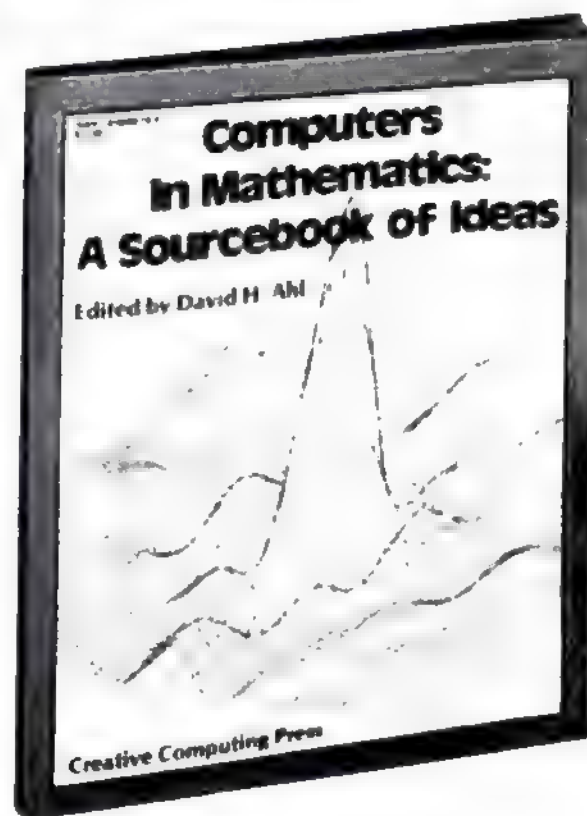
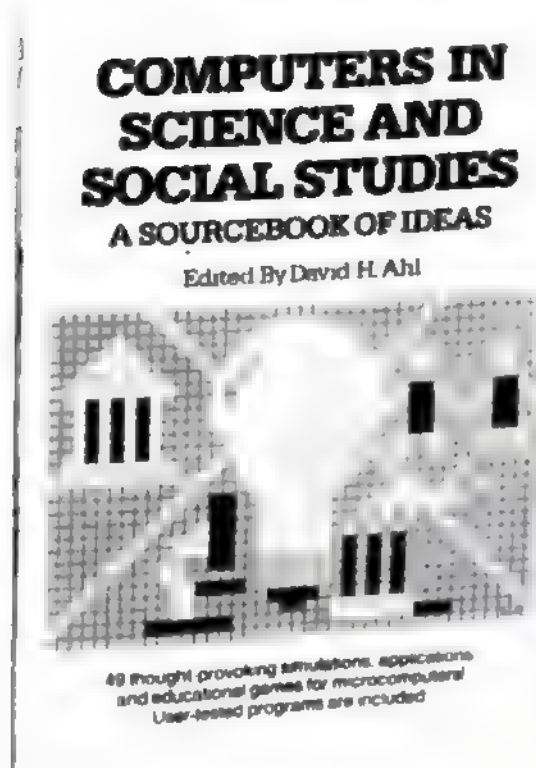
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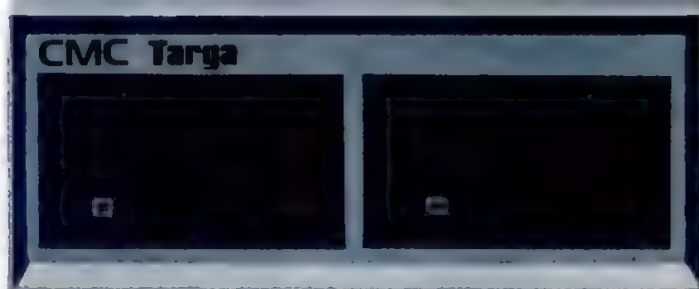
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# Toward More Colorful Writing

Colortext helps solve some, but not all, of these problems. You use the word processor of your choice to create a document



## COLORTEXT COMMAND SUMMARY

COLOR COMMANDS	COLOR OF PRINT
%RED	RED
%DRED	BRIGHT RED
%YEL AND %DRED	FIRE ENGINE RED
%ORA	ORANGE
%DYEL AND %ORA	BRIGHT ORANGE
%VEL	
%DYEL	
%GRE	GRASS GREEN
%GRE AND %BLU	SEA GREEN
%GRE AND %BLA	FOREST GREEN
%YEL AND %GRE	CHARTREUSE
%BLU	BLUE
%DBLU	BRIGHT BLUE
%BLA AND %DBLU	NAVY BLUE
%VIO	VIOLET
%BLU AND %VIO	PURPLE
%VIO AND %RED	RED-BROWN
%BRO	WARM BROWN
%DYEL AND %BRO	BURNT UMBER
%GRE AND %RED	BLACK
%BLA	BOLD BLACK

## CHARACTER SET COMMANDS

CORRESP.	DRAFT		
%USA	%DUSA	USA	0 0 ( - 0 ( 1 ) ' ' ( 1 ) -
%EN1	%DEN1	ENGLISH-1	2 0 ( - 0 ( 1 ) ' ' ( 1 ) -
%EN2	%DEN2	ENGLISH-2	0 2 ( - 0 ( 1 ) ' ' ( 1 ) -
%FRE	%DFRE	FRENCH	2 0 ( - 0 ( 1 ) ' ' ( 1 ) -
%SPA	%DSPA	SPANISH	0 0 ( - 0 ( 1 ) ' ' ( 1 ) -
%GER	%DGER	GERMAN	0 0 ( - 0 ( 1 ) ' ' ( 1 ) -
%NOR	%DNOR	NORWEGIAN	0 0 ( - 0 ( 1 ) ' ' ( 1 ) -
%SWE	%DSWE	SWEDISH	0 0 ( - 0 ( 1 ) ' ' ( 1 ) -

## TYPE SIZE/SPACING COMMANDS

%5CPI	5.0 CPI	Five characters
%6CPI	6.0 CPI	Six characters
%8.4CPI	8.4 CPI	Eight point four characters
%10CPI	10.0 CPI	Ten characters
%12CPI	12.0 CPI	Twelve characters
%16.8CPI	16.8 CPI	Sixteen point eight characters
%PRO	PROPORTIONAL SPACING	AbCdEfGhIjKlMnOpQrStUvWxYz
%FIX	FIXED SPACING	AbCdEfGhIjKlMnOpQrStUvWxYz

Figure 1: A summary of Colortext commands.



## COLORTEXT

THE KEY TO THE PRISM PRINTER FROM INTEGRAL DATA SYSTEMS

## COLORTEXT CENTERS YOUR TEXT

4  
SIZES  
OF TYPE

AUTOMATICALLY  
AND MAKES IT EASY  
TO CREATE ELABORATE  
DECORATIVE EFFECTS

8  
COLOR  
CHOICES

COLORTEXT offers characters for six foreign languages

With COLORTEXT you can choose fixed or proportional spacing. COLORTEXT also prints in Book-Text style—that is, in superscript and proportionally spaced type which is automatically justified at the left and right margins. This is an example of Book-Text style print.

Figure 2: Examples of IDS Prism output with Colortext.

This is an example of copy prepared in "Book-Text" mode. Note that the intercharacter spacing within each line differs, and that each line (except the last) of the paragraph is justified both left and right.

These characters are printed in draft mode:

Five characters  
Six characters per  
Eight point four characters  
Ten characters per inch  
Twelve characters per inch  
Sixteen point eight characters per inch

Figure 4: Examples showing printout of Book-Text and draft modes.

that includes special commands for Colortext. When you're ready to print, you run your document file through Colortext instead of the word processor.

A percent sign (%) in column one of the document tells Colortext that the rest of the line is a command, of which more than 50 are available (see Figure 1). Most commands—including those for color, margination, and character set and size—affect subsequent text until they are changed. Others—such as those setting text flush right, centering it, or overprinting—affect only the line immediately following the command. Microspace justification, which Colortext calls "Book-Text" mode, requires a command be embedded before and after each paragraph.

Simple? Let's toss a few of those commands into our WordStar files and see our

name in living color.

## File Fussiness

Not so fast, rainbow digits. Colortext isn't as finicky as the Prism about the files it's willing to hang out with, but it is definitely particular. What it really wants is a file with a carriage return after each line and no special characters anywhere. That sort of file, unfortunately, is not what most word processors give us.

WordStar's standard document mode, for example, produces files with special characters you can see while you're creating text—such as Ctrl-S for underlining. It also adds special characters you can't see unless you examine the file by typing Type Filename from DOS—characters that mark page breaks, end of word-wrapped lines, and God knows what all.

These all must go if Colortext is to perform its magic.

PeachText, on the other hand, stores each paragraph as one long line with the only carriage return appearing at the end. That won't satisfy Colortext, either.

## File Fixing

The Colortext manual gives some particulars about converting existing WordStar files for its use. Unless you are a WordStar expert, however, this procedure won't be easy. The manual advises that it is better to create Colortext documents in WordStar's N (non-document) mode. The key here, undocumented in the manual, is to use WordStar's mostly ignored Ctrl-OV command to change the fixed tabbing default to the more familiar variable-tabbing mode. Failure to do this will proba-

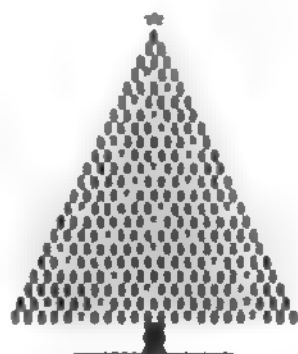




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Best wishes for a happy Holiday Season and a prosperous New Year!

Sincerely,

**Jean Robinson**  
Owner/Manager



COLORTEXT by JUPITER ISLAND CORPORATION

**Figure 3: A letter from Jupiter Island's samples disk.**

bly leave your files studded with nasty items known as ASCII tab characters. They are invisible even from DOS. They can cause big problems in editing, and they are generally Bad Characters. The Colortext manual doesn't mention them, and the index to the WordStar manual doesn't tell you where to find out about them. I learned from bitter experience.

I didn't experiment with *PeachText*, but I suspect that all its files need is a paragraph marker (aka carriage return) at the end of each line. Other word processors will have their own idiosyncrasies.

## Colorful Sounds

**All right; you've created a special document. You've supplied all the proper carriage returns and gotten rid of all the control characters. You've copiously salted**

the file with Colortext commands. Now you're ready to see if your printer can talk a blue streak.

**Invoke Colortext by typing CTX. Respond to two prompts asking you for the name of the file to be printed and the number of copies you want (up to 9999). The next sound you hear will be your Prism printer merrily producing color copy.**

And what sounds! You have not lived until you've watched and listened to the Prism go through its paces on the sample provided with the Colortext disk. The Prism grunts, groans, snores and squeals as it pulls and pushes the paper back and forth for overprinting, shifts through its

half-dozen character sets, justifies text in two-column blocks, and outputs a page so full of parti-colored cedillas, circumflexes, umlauts, and tildes that it resem-

```

F F F F F F F F F F      C C C C C C C C C C
F F F F F   F F F F F   C C C C C C C C C C C C
F F F F F   F F F F F   C C C C C   C C C C C
F F F F F   F F F F F   C C C C C   C C C C C
F F F F F   F F F F F   C C C C C   C C C C C
F F F F F   F F F F F   C C C C C   C C C C C
F F F F F   F F F F F   C C C C C
F F F F F F F F F F   C C C C C   C C C C C
F F F F F               C C C C C   C C C C C
F F F F F               C C C C C   C C C C C
F F F F F               C C C C C   C C C C C
F F F F F               C C C C C   C C C C C
F F F F F               C C C C C C C C C C C C
F F F F F               C C C C C C C C C C

```

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```

PPPPPPPPPP      CCCCCCCCCC
PPPPPP  PPPPP  CCCCCCCCCCCCCC
FPPPP  PPPPP  CCCCC  CCCCC
PPPPPP  PPPPP  CCCCC  CCCCC
PPPPPP  PPPPP  CCCCC  CCCCC
PPPPPP  PPPPP  CCCCC  CCCCC

```

```

PPPPPPPPPP  CCCCC  CCCCC
PPPPPP  CCCCC  CCCCC
TTTTT  CCCCC  CCCCC
PPPPPP  CCCCC  CCCCC
TTTTT  CCCCCCCCCCCCC
PPPPPP  CCCCCCCCCCCCC

```

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P P P P P P P P P P	C C C C C C C C C C
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P P P P P    P P P P P	C C C C C     C C C C C
P P P P P    P P P P P	C C C C C     C C C C C
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P P P P P	C C C C C C C C C C C C
P P P P P	C C C C C C C C C C

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**Figure 5: Three versions of a familiar logo.**

bles nothing so much as an explosion in a Common Market print shop (Figure 2). This might well be the best cheap computer date since chatting with ELIZA.

Jupiter Island offers an additional disk of examples, including the Christmas tree letter (see Figure 3) and the color mixing chart in Figure 1. The company charges \$10 for the demonstration; considering that all the examples will fit on the single-sided program disk, the demo should be free. However, it is the best way to learn how to do fancy decorative borders and complicated character graphics. And it also gives you some idea of which colors look good together—and which don't.

The Colortext manual was set on a Prism printer using the "Book-Text" mode (see Figure 4). In this mode you're limited to single-pass colors: black, red,



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blue, and the faint-and-mostly-for-mixing yellow. You give a %BON command at the beginning of the paragraph, and signify the end of the paragraph with a %BOF command. In this mode, Colortext interprets the carriage return at the end of each line as a space and lets the Prism worry about justifying the text.

### Learning To Color

Colortext's error trapping is good. If you do something egregiously stupid—entering a command it does not recognize or ordering it to do something impossi-

ble—Colortext sends you an onscreen error message. Otherwise, it is time to take a look at your text. If you did everything right, you're in business. If not, it's back to the word processor for a fix.

How hard is it to learn the workings of Colortext? For most of the commands, the answer is "not very," once you get your text files into proper shape. Trying the 19 examples offered in the manual gives you a fair working knowledge of Colortext's capabilities. I had most of the examples working on the very first try.

Avoid the tabbing commands, though,

unless you are very friendly with those Bad Characters I mentioned above. The manual definitely does not provide a proper introduction.

### The Experiment

The PC logos (see Figure 5) were my experiment. The all-green one was duck soup. The rainbow version was a lot more complicated. Using the 12 basic colors—the ones in Figure 1 that require only one command—would have been fairly straightforward, but I decided to try some of the two-command shades. Those require overprinting, for which you have to issue a %NOSPACE command to keep the paper from moving, and then duplicate the line precisely in the text. The problem, of course, is that you are likely to forget one of the duplicate lines and end up with a color you don't want. I kept a careful count of the duplicated lines, and the rainbow version came out fine.

The green and blue PC was fairly straightforward, too. I printed the P first, then reverse-fed the paper and reset the margins before doing the C. I learned that when things don't go right, incorrect margins should be a prime suspect. The Prism will wrap any excess material down to the

**COLORTEXT IS A utility specifically designed to harness the talents of the Prism printer.**

next line when it reaches the right margin. I had stupidly set that margin a trifle too narrow—and paid for it with confusion and irritation. But fixing it was a matter of adjusting only one command.

### Annoyances

A few irritations: The character size commands are all whole numbers except for the 8.4 and 16.8 sizes. It's annoying to have to remember what comes after the decimal point in those commands, but if you omit it, you'll get an error message.

Underlining is a problem: In fixed-space mode you have to issue a %NOSPACE command and enter the underline

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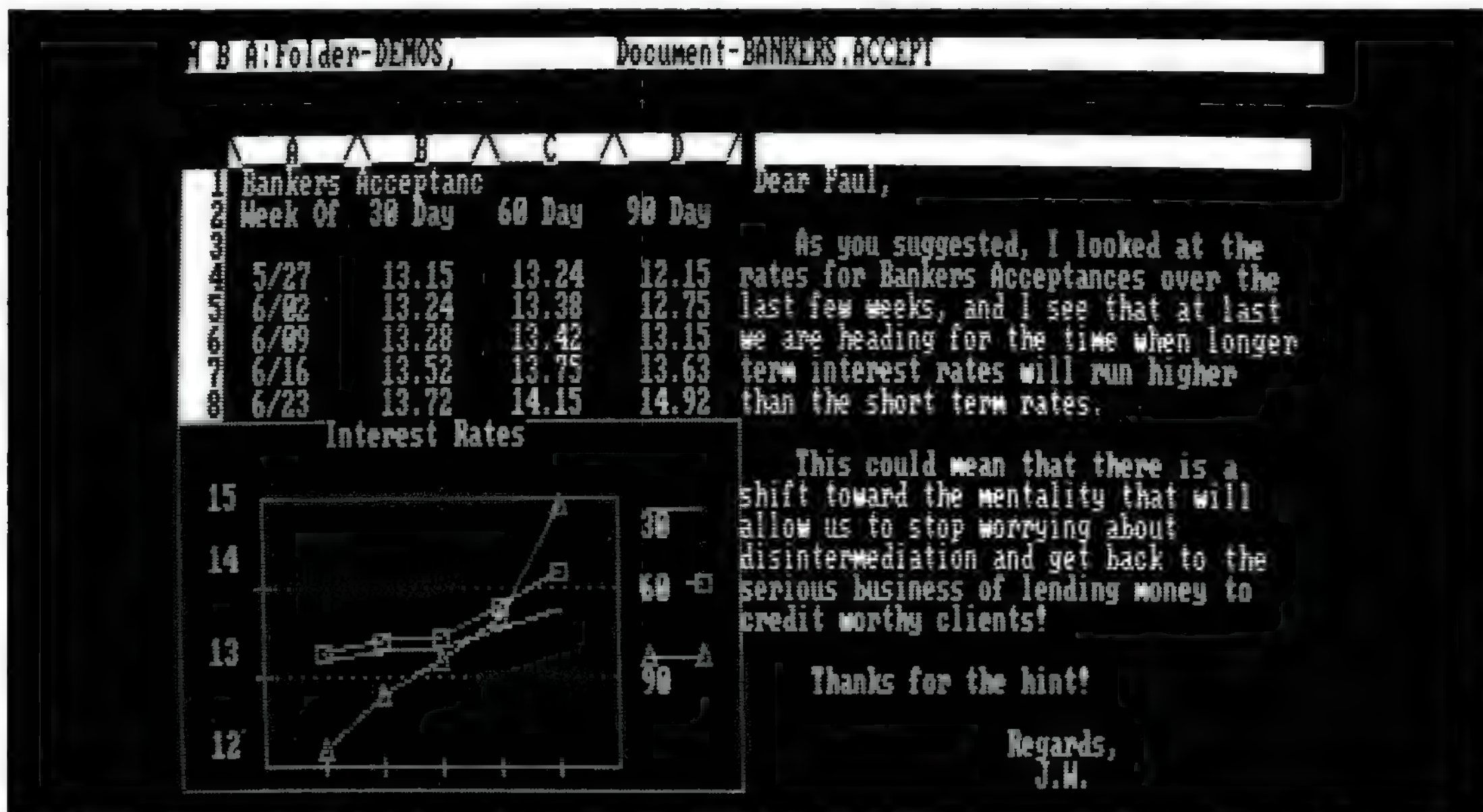
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by overprinting, but there's no good way at all to underline accurately in proportional spacing or Book-Text modes.

The manual doesn't tell you how to exit the program. Ctrl-Break sometimes works; while printing, however, the only choice is to turn off the printer. This isn't a

**D**OING ALL those reverse feeds and laying down all those overprinted dots is not speedy.

bad idea, anyway; the Prism's buffer will delay response to keyboard commands.

Doing all those reverse feeds and laying down all those overprinted dots is not speedy. It's really a limitation of the printer rather than the software, but printing a single letter-size page with a lot of fancy stuff can take as long as 3 minutes.

Perhaps the biggest nuisance is that if the Prism is running in parallel mode, Colortext insists on doing a form feed every time you invoke it. This means that you end up using precisely twice as much paper as you really need, when all you want to do is test one of your designs. Jupiter Island president, David Strauss, says the culprit is IBM's BASIC compiler, and that the form feed isn't activated when running the Prism from a serial port.

A final shortcoming: Colortext would be enhanced if it had a utility that automatically adjusts WordStar and other document files for use on the Prism. This would make the program handier for frequent users.

### User Support

The Colortext manual and supplement could be better organized, but they get the job done, providing you're reasonably familiar with the Prism's basics. I particularly like the inclusion of actual color printouts of the examples. You get to compare your output with the manual to see what, if anything, is wrong.

Another nice touch is the table showing which keyboard characters produce which foreign characters. IDS didn't bother to include this information in their

manual for the Prism.

The manual warns about potential jamming problems when reverse-feeding lightweight paper. Sticking with 20-pound continuous forms and single sheets, I did a lot of reverse feeding, and never ran into anything remotely resembling a jam.


When I phoned Jupiter Island with a couple of questions, I was put through in just seconds to the operations manager (before revealing my journalistic identity). Not only that, David Strauss returned my call immediately. I get the feeling Jupiter

Island won't leave you in the lurch.

### Final Thoughts

How much would I use this program? Hard to say. When I bought my Prism about a year ago, I wrote a group of utility programs in BASIC to handle a few of the things Colortext takes care of so nicely—such as printing my letterheads.

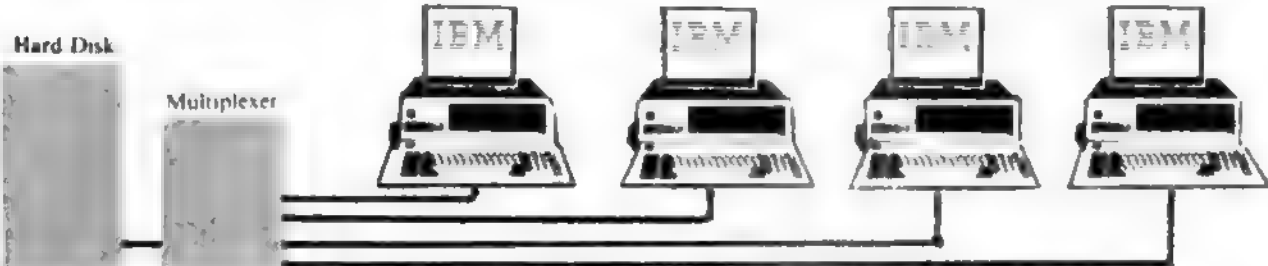
But I use my Prism mostly for text, so I generally use the all-black ribbon. Since you can shift through its four black bands, it lasts much longer than the color model. It's also cheaper and gives a much more



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intense black than the process ribbon. Changing ribbons from all-black to color requires careful cleaning of the Prism ribbon-handling rollers, gears, and guides with alcohol to avoid contaminating the process ribbon. It's a messy, painstaking process, indeed.

But if you use the color ribbon regularly, there's no problem. And in fooling around with this program I found that color is just plain fun. The Colortext manual implies that you might use the product for such things as menus, wine lists, and advertising flyers, which sounds reasonable enough to me.

On the other hand, while quite good for dot-matrix output, text from the Prism isn't going to fool anybody into thinking your text was typeset or even typewritten. The Prism is not a printer I can easily recommend. Many of its design features are compromises. And some aspects of the machine seem utterly wrongheaded.

Should you accidentally use it to overstrike another color, the yellow portion of the process ribbon can become contami-

nated. Also, sections of the ribbons exposed to air have a tendency to dry out and turn faint.

The Prism uses a lot of plastic foam for

**P** RISM ISN'T  
going to fool anybody  
into thinking your text  
was typeset or even  
typewritten.

sound insulation, but that foam also traps heat. The ventilation slots are blocked by the paper emerging from the machine, so the Prism runs hot. To keep it cooler, many of us remove the window for big jobs, thereby turning a moderately noisy machine into a genuine ear-blaster.

The Prism can read only 7-bit characters, so it treats ASCII characters 128

through 255 as though they were 128 numbers lower. And the IBM Printer Adapter looks for some signal the Prism doesn't send. When you run the IBM diagnostic, it cannot be made to "see" the Prism. I have also had trouble getting software spoolers to perform properly.

Many of the failings of my Prism (including five defective windows and a tendency to chew up ribbons) have been fixed free by IDS, and I'm told those fixes have been incorporated into the design of more recent machines. But other color printers are now coming onto the market at prices far below the Prism's.

If you already own a Prism, who knows? That little edge Colortext can give your documents just might turn your competitors green with envy—or get them to see red. /PC

Contributing editor Stephen Manes is author of *Video War* (Avon) and *That Game From Outer Space* (Dutton). He is co-author of the anti-gravity fantasy *The Bananas Move To The Ceiling* (Watts).

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## **SandStar™ 5¼" & 8" Floppy Drive Controller Cards**

Now you can control up to four 5¼" floppy drives with the 5¼" Floppy Drive Controller Card. The 8" Card is engineered to the same specifications with the exception that it controls two 8" drives externally.

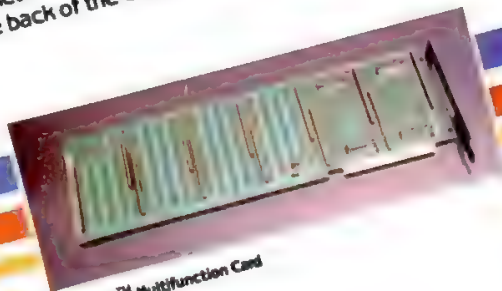
## **SandStar™ Game Adaptor Module**

Both Cards will accept up to three SandStar™ Modules.

Playing your favorite game is now easier than ever. Up to four paddles or two joysticks can be attached. Also, the Module can be used for input with four digital inputs and four analog inputs which are useful for general purpose graphic applications. It uses the same type 15 pin "D" subminiature I/O connector as the IBM Game Control Adaptor.

## **SandStar™ Cable Bracket Module**

The SandStar™ Cable Bracket Module is designed for easy connector mounting of the SandStar™ I/O Modules. It allows you to cable all modules from the back of the card itself without any troublesome jury-rigging.



SandStar™ Multifunction Card



SandStar™ 5¼" & 8" Floppy Drive Controller Cards



# Obsolescence!

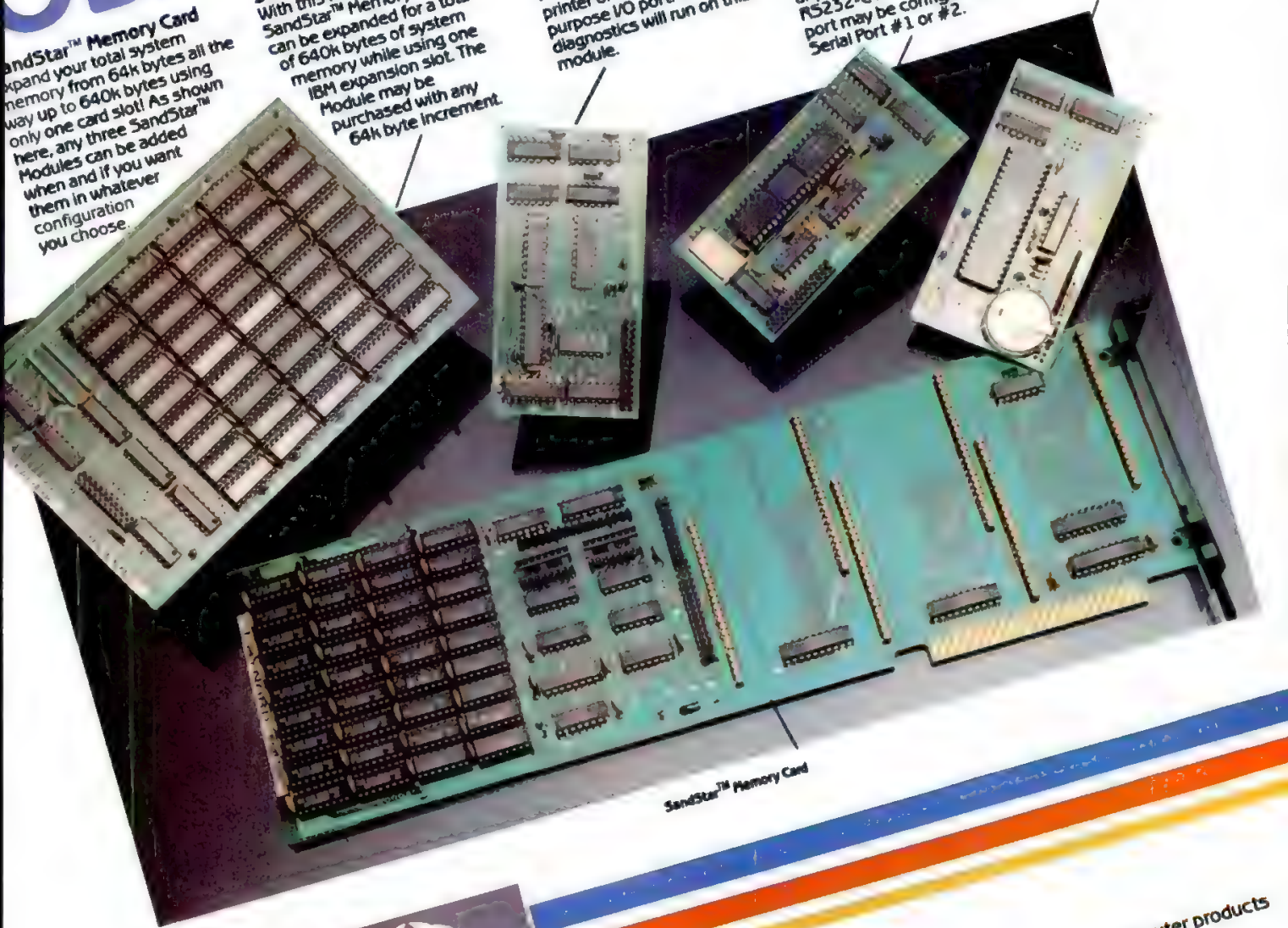
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Expand your total system memory from 64k bytes using only one card slot! As shown here, any three SandStar™ Modules can be added when and if you want them in whatever configuration you choose.

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This port is a Centronics™ compatible I/O port which may be used to connect a printer or used as a general purpose I/O port. IBM diagnostics will run on this module.

**SandStar™ Serial Port Module**  
This module is totally compatible with software written for the IBM Asynchronous Adaptor and may be used to connect to a MODEM, serial printer or any device using a standard RS232-C interface. The port may be configured as Serial Port #1 or #2.

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This module automatically loads the correct time and date each time the system is powered up. The clock and calendar are equipped with battery back-up and run even when the power is turned off or the unit is unplugged. Software included.



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CIRCLE 302 ON READER SERVICE CARD





# CONSIDER THE OPTIONS...WE HAVE NINE.

## Develop your PC's full potential.

So many other competitors have only four or five real features with their combination cards. But while the others were trying to count to higher numbers, we were designing real features into our card. Real features like a BSR X-10 AC line controller interface, game port, and program-mable 8 bit I/O and 4 bit output ports.

And, of course we have the normal features of 64K to 256K of memory with parity, serial interface (either COM1 or COM2), Centronics-compatible parallel interface (LPT1, LPT2, or LPT3), and Clock/Calendar with Battery backup. To top it off, we offer the print spooler and RAM disk software free of charge with purchase of the card.

## Why Us?

Years of experience by our design staff in the industrial computer market have resulted in fifteen different computer cards used in process-control systems. Applications which demand the most from any piece of hardware. We believe you have the right to demand competence and expertise. Our card passes the test.

## Zero to nine functions in 15 minutes.

Our installation documentation is in extreme detail, with pictures and explanation of how to install the board yourself. All you will need is a screwdriver. The board is completely silk-screened and solder masked. In

addition, a comprehensive burn-in program is undertaken on all cards to insure the highest measure of reliability.

## Grow into this card as you grow into your computer.

The IBM compatible serial port, parallel port, and clock/calendar functions are powerful features. Add to that 64K to 256K of socketed (parity checked) memory and it's quite a combination. But it's at this point that we begin to shine. Like in a game port which supports the operation of two joysticks, or with the BSR X-10 AC Line Controller Interface which allows you to remotely control lights, appliances, or other AC line components with your IBM PC. There are no wires to cut or solder and the software is provided with the card. We think you can use this feature for a variety of purposes, including security and energy management. Add to that our Real World Interfaces (8 bit I/O and 4 bit Output ports) and you will be able to control discrete devices. So whether you have an application now or later, you can grow into this card as you grow into your computer.

## The time is now.

We are presently offering the card with a BSR X-10 AC Control System and transducer cable for an additional \$29. The Control System includes the Ultrasonic Command Console and two Lamp Modules. Our products are warranted for a full 12 months from date

of purchase. Warranty repairs are made within 24 hours of receipt. Finally, if you are not completely satisfied within 30 days, we will return the entire cost of your purchase + postage. It's an offer we don't think you can refuse.

## BSR X-10 CONTROL SYSTEM (\$29)

Act now to receive the BSR Control System plus interface cable for \$29 with purchase of a card. The value of the Control System plus cable is \$120.

## PRICES

(Add \$29 to receive your BSR System)

64K	\$595	192K	\$775
128K	\$685	256K	\$865

## PRICES INCLUDE:

Memory • Serial Port • Parallel Port with Cable • Clock Calendar • BSRX-10 AC line interface • Game Port • Real World Interfaces • RAM Disk Software • Print Spooler Software • Support Software

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## SHIPMENT:

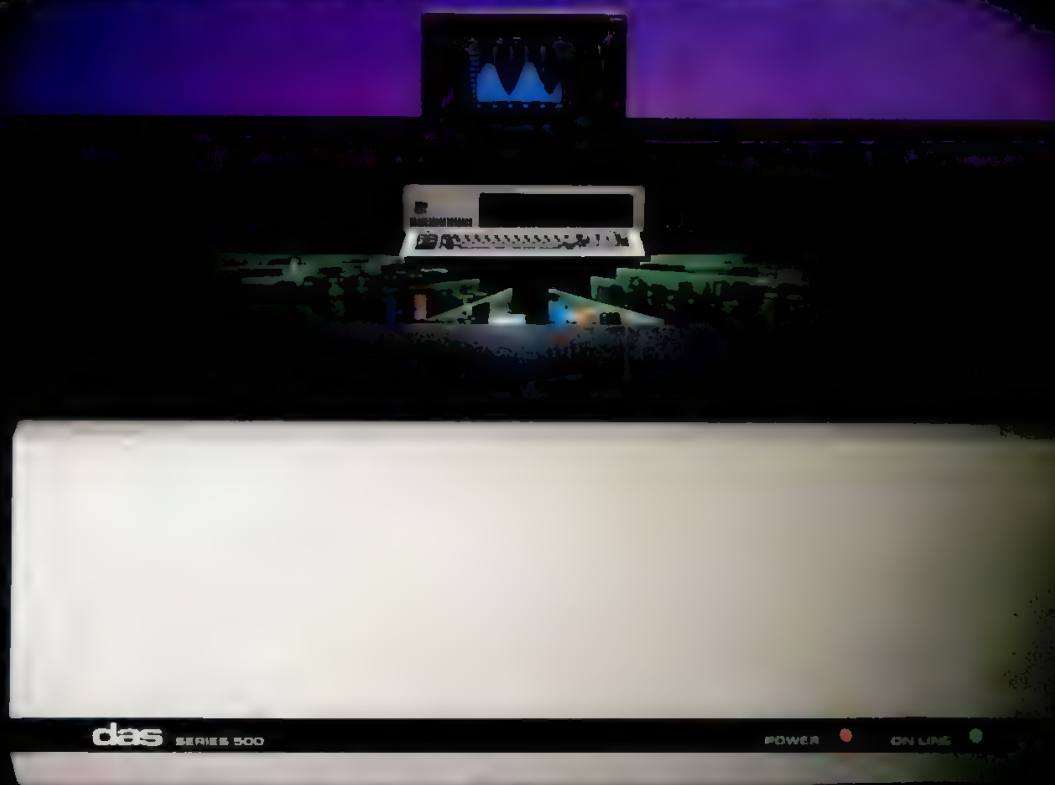
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If you need flexibility, you'll want to compare other, more costly systems to the fully modular Series 500. It comes supported by an extensive library of integrated plug-in modules that let you custom tailor almost any

combination of inputs and outputs, digital or analog. And do so almost instantly.

So the Series 500 is ideal for hundreds of applications in product test, process control and energy management; in psychology, biology, analytical chemistry and neuroscience.

If ease of use is high on your list, consider this: Only the Series 500 comes equipped with the advanced, integrated Soft500 software package. With it, you can set up, collect, store, control, display and analyze, all with a few simple BASIC commands.

In fact, Soft500 makes programming so easy, you can be up and running with your Series 500 the same day you get it. Even if you're not a computer expert.

Now compare advanced features. Like exclusive foreground/background software architecture that lets you analyze data while you collect it. Like the real-time clock/calendar and precision interval timer.

Or the tremendous range of signal conditioning options, including software selected gain and offset, amplification from millivolt levels, and provision for direct connection of thermocouples, strain gauges and RTDs.

These are features you might not get elsewhere, no matter how much money you spend. But then, why spend all that money?

Because for less than \$6000 you get both the advanced capabilities of the DAS Series 500, plus an IBM PC (which incidentally, you can still use to do all the other things a PC does so well).

For complete information on the DAS Series 500 data acquisition and control system, write to us at Data Acquisition Systems, Inc., 349 Congress Street, Boston, Massachusetts 02210. Or call us at 617 423-7691.

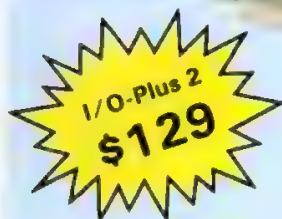


CIRCLE 203 ON READER SERVICE CARD

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MegaPlus 64k  
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## Now you can buy a QUAD function IBM PC board without having to buy more memory.

MegaPlus™ and I/O-Plus 2™ are the ultimate add-on products you will need to expand your IBM PC and XT. Which board you decide on depends on where you are headed. To take full advantage of your IBM PC and XT beyond 256k, you will want to expand with the MegaPlus™. It's features include two asynchronous ports, clock/calendar, printer port, and up to 512k of memory expansion. Ah! You say you already have all the memory you need? The I/O Plus 2™ gives you all the features of Mega-Plus™ to operate your printers, plotters and modems, set your time and date automatically with the clock/calendar, without adding memory. Also a special game adapter is available, but more about that later. Both boards include SuperDrive™ disk emulation and SuperSpool™ print buffer software.

### MEGA WITH MEMORY

The MegaPlus™ has three functions standard: Parity checked and fully socketed memory up to 256k in 64k increments; clock/calendar with battery back-up for automatic loading of time and date when the computer is turned on; and an asynchronous communication port (RS232C serial) which can be used as COM1 or COM2, (DTE for a printer, or DCE for a modem). Optional is a 100% IBM compatible parallel printer port, and a second asynchronous port for another \$35 each. The MegaPak™ option plugs onto your Mega-Plus™ "piggyback" style to give you 512k of additional memory. Now you can create disk drives in memory up to 360k, set aside plenty of space for print spooling, and still have memory for your biggest programs.

### I/O-PLUS 2 WITHOUT MEMORY

The I/O-Plus 2™ comes standard with a clip-on battery powered clock/calendar, and asynchronous communication port (RS232C serial). Optional is a second asynchronous port (DTE for a printer, or DCE for a modem), a parallel printer adapter, and the best game paddle adapter on the market. What's so special about our game adapter? Not only is it an IBM standard game port, but it can also use low cost, widely available Apple compatible paddles and joysticks. If your memory needs are satisfied, for less than the price of most single function boards, I/O-Plus 2™ gives you all the input and output ports you might need.

### FREE SOFTWARE

SuperDrive™ disk emulation software creates "disk drives" in memory which access your programs at the speed of RAM memory. SuperSpooler™ print buffer software allows the memory to accept data as fast as the computer can send it and frees your computer for more productive work. Some manufacturers sell hardware print buffers that do only this for hundreds of dollars. SuperSpooler™ eliminates the need for these slot robbing products. Both of these powerful pieces of software can be used with any expansion memory for your IBM PC or XT.

### CHEAP SOFTWARE TOO

What good is great hardware without some great software to use it with? We offer some terrific prices on some of the popular programs you will want to use your board with. How about the cream of the spreadsheet programs, SUPERCALC, for just \$159, or SUPERWRITER for \$239. If you are looking for data base management you can get dBASE II by Ashton-Tate for \$419.

### WHY BUY IT FROM US?

Because we provide the service and support most companies just talk about. Each board is fully tested and burned in prior to shipment. We realize how integral this board is to the use of your computer. What good is a warranty if it takes weeks for repairs to be made? We offer 48 hour turnaround or a replacement board on all warranty repairs. Do you hear anyone else making this promise? If you still are not convinced, and want to compare prices, remember we don't charge extra for credit cards, shipping, or COD fees. We think the ultimate testimony to our good service and high quality is that one of our largest customers is none other than IBM! If you still want to buy elsewhere, ask any competitor if they will face the acid test.

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Qubie' (say que-bee-A) gives you a 30 day satisfaction guarantee on all board purchases. If you are not completely satisfied we will refund the entire cost of your purchase as well as pay the postage to return it. If you can get one of our competitors to give you the same guarantee, buy any other board you think compares and return the one you don't like. We're not worried because we know which one you

will keep. We also offer a one year parts and labor warranty. An additional one year extended warranty is available for \$50.

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- daytime phone number
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*2 Y's offer a high-quality, cost effective business graphics program that provides access to VisiCalc and SuperCalc*

# The Graphics/Data File Connection

---

## **MICROGRAPH by 2Y's (MCG)**

2Y's Associates Limited  
P.O. Box 6733, Station J  
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K2A 3Z4 Canada  
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**List Price: \$245**

**Requires:** 64K, color or non-IBM graphics monitor, graphics adapter board.

---

**CIRCLE 590 ON READER SERVICE CARD**

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The developers of MicroGraph by 2Y's (MCG) envision a software program that allows the average business user to create high-quality, cost-effective graphics. 2Y's Associates seem to have accomplished its objective. MCG does produce business-quality screen and printer graphics at a reasonable cost. MCG is easy to use and learn, and the program produces screen graphics with impressive speed.

### **Features**

MCG draws line graphs, bar charts (stacked, hidden, or side by side) X-Y

plots (with descriptive statistics and "least squares" trend line) and pie charts. You can display up to four series on the line- and bar-chart graphs and up to two series on the X-Y and pie-chart graphs. But, in a bar chart, when more than two series are used, the hidden-bars option is not available.

The package is designed to run on the IBM PC with minimum 64K RAM and either a color or noncolor graphics monitor with the graphics-adapter board. MCG can be used with any Epson printer with the Graftrax option or the IBM dot-matrix printer. Additional modules can be purchased for the HP 7470 plotter and the Calcomp 81 plotter. Both modules require 128K RAM and cost \$50 each.

The approach used by MCG to manage data series is simple and straightforward. A standard DOS data file, counting up to 40 layouts, is used as the largest unit of MCG data storage. A layout, the next largest unit of MCG data storage, contains all of the data from which a given graph is generated and can contain up to four data

series with up to twenty-four observations in each series.

MCG can use your spreadsheet data without the time-consuming task of re-entering it. The package allows access to data files produced by VisiCalc and SuperCalc. I had very little trouble in producing a SuperCalc output file that was easily and quickly read into an MCG "database." However, packages that have integrated spreadsheet and graphics modules have an advantage over MCG's spreadsheet data-access capability because with MCG, the visual impact of data changes in the spreadsheet is not immediately reflected. But MCG does allow the user to view a model with a stand-alone graphics package. With this time-saving feature you do not have to re-enter data from spreadsheet files.

### **Menu Options**

MCG has a few shortcomings, but ease of installation and use are not among them. The installation instructions provided in the manual are clear and easy to





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CIRCLE 291 ON READER SERVICE CARD



Figure 1 shows a display of MCG's main menu. If you want to enter data for a new graph, you use main-menu options 1 or 5. If the data is to be entered manually, select option 1. A blank layout screen will

**D**ATA TRANSFER  
from one application to  
another is probably one  
of the most difficult  
operations faced by the  
nontechnical user.

The data is entered with relative ease. Any definition fields may be left blank for later modification, and missing data points are shown by using the value -999. I used the main-menu option 1 to enter data manually for the stockbroker statistics (shown in Figures 2 and 3). I entered and graphed this data in less than 5 minutes.

To transfer layouts from one DOS data file to another, use the Extract option. This is the primary method used by MCG to eliminate obsolete layouts. To transfer VisiCalc or SuperCalc data MCG, choose the Read option. This feature is cumbersome but highly useful. Data transfer from one application to another is probably one of the most difficult operations faced by the nontechnical user. However, the manual illustrates as well as describes the spreadsheet-transfer process clearly.

**Use the Graph option (main menu item 6) to produce all graphs except those using**

```

      ~~~~~~
      : C C C L L C C C C C C C L L C C C C :
      ~~~~~~
      SDB          AC          DD=
      data file name DFMO.MC6

[1] New layout; data entry
[2] Display of layout data
[3] Modification of layout data
[4] Extract layout data from another file
[5] Read Visifab generated data (DIF format)
[6] Graph (high or medium resolution)
[7] Independent variables (scatter diagram)
[8] Select another file name
[9] EXIT [ ]

```

```

Layout name: STOCK BROKER STATISTICS
Title line 1 FULL TIME REGISTERED REPRESENTATIVES
Title line 2 (New York) Stock Exchange Member Firms)
Units ident. Vert. axis label NUMBER OF BROKERS
Horiz. axis (Source: Lipper Analytical Distributors, Inc.)
#####
Obs.\Ser. 1 2 3 4
#####
1 1972 39970 -999 -999 -999
2 1973 36290 -999 -999 -999
3 1974 33306 -999 -999 -999
4 1975 34643 -999 -999 -999
5 1976 35289 -999 -999 -999
6 1977 37720 -999 -999 -999
7 1978 40687 -999 -999 -999
8 1979 43921 19200 999 -999
9 1980 46702 26400 -999 -999
10 1981 51603 25000 -999 -999
11 1982 55000 30000 -999 -999
12 1983 58500 32000 999 999
#####
Series 1 NUMBER OF BROKERS Series 2 AVG. COMMISSIONS IN 1ST YEAR
Series 3 Series 4

Enter <CR> to return to the menu

```

**FULL TIME REGISTERED REPRESENTATIVES**  
(New York Stock Exchange Member Firms)

The chart displays two data series from 1972 to 1983. The first series, 'NUMBER OF BROKERS', is represented by solid black bars and shows a steady increase from approximately 37,000 in 1972 to nearly 60,000 in 1983. The second series, 'AVG. COMMISSIONS IN 1ST YEAR', is represented by checkered bars and is only plotted for the years 1979 through 1983, showing an upward trend from about \$14,000 to \$26,000.

Year	NUMBER OF BROKERS	AVG. COMMISSIONS IN 1ST YEAR
1972	37,000	
1973	36,000	
1974	35,000	
1975	36,000	
1976	37,000	
1977	38,000	
1978	39,000	
1979	42,000	\$14,000
1980	45,000	\$21,000
1981	48,000	\$20,000
1982	52,000	\$24,000
1983	58,000	\$26,000

(Source: Lipper Analytical Distributors, Inc.)

■ NUMBER OF BROKERS      ▨ AVG. COMMISSIONS IN 1ST YEAR



Figure 4: Sample graph showing MCG's "stacked" bar-charting capabilities.

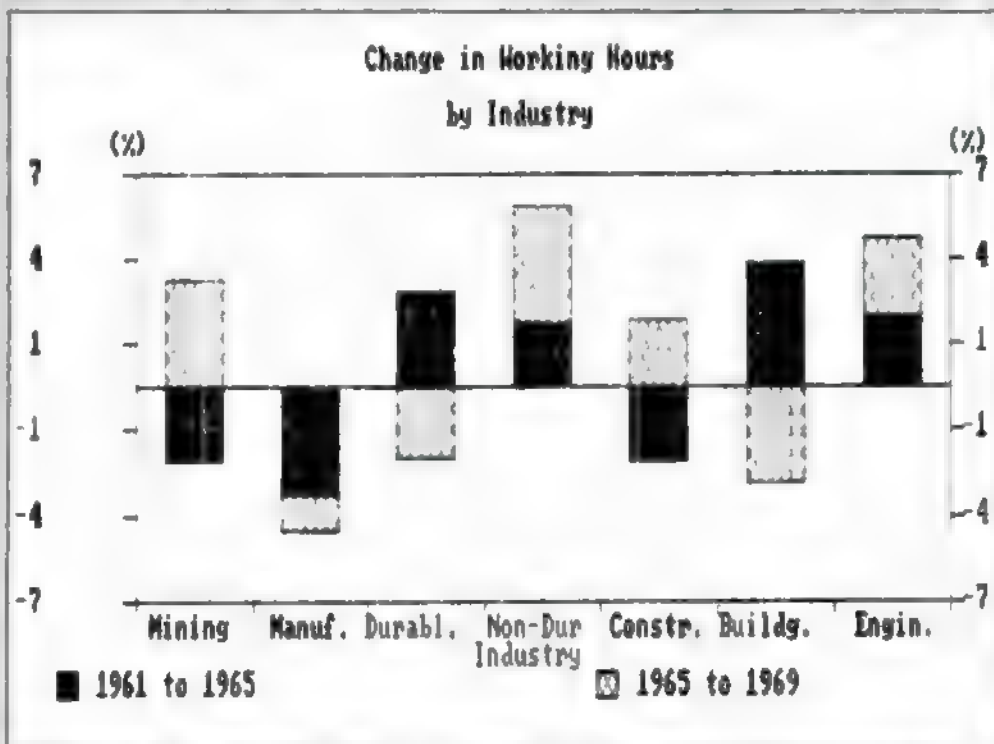


Figure 5: Sample graph showing MCG's "hidden" bar-charting capabilities.

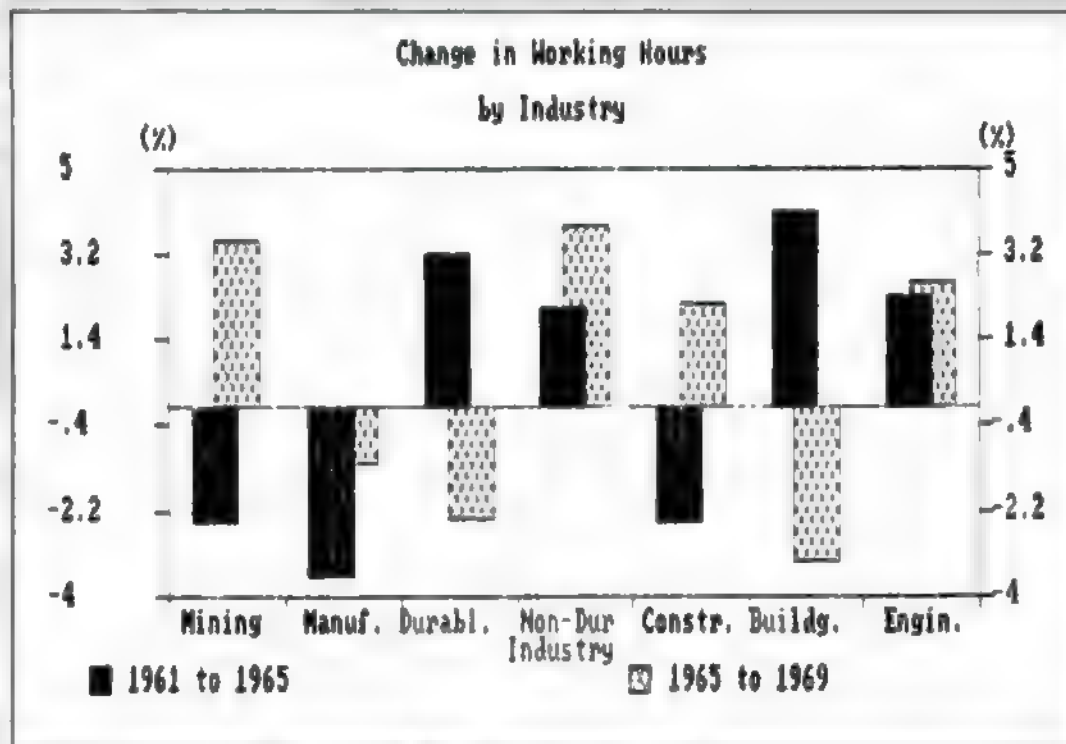


Figure 6: Sample graph showing MCG's pie-charting capabilities.

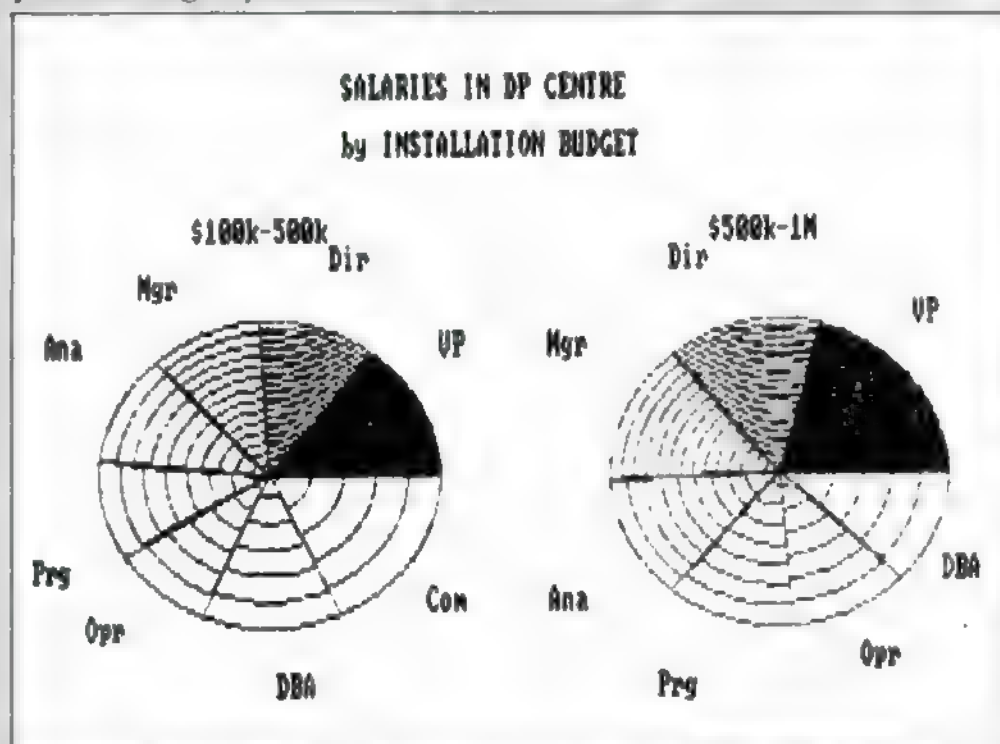
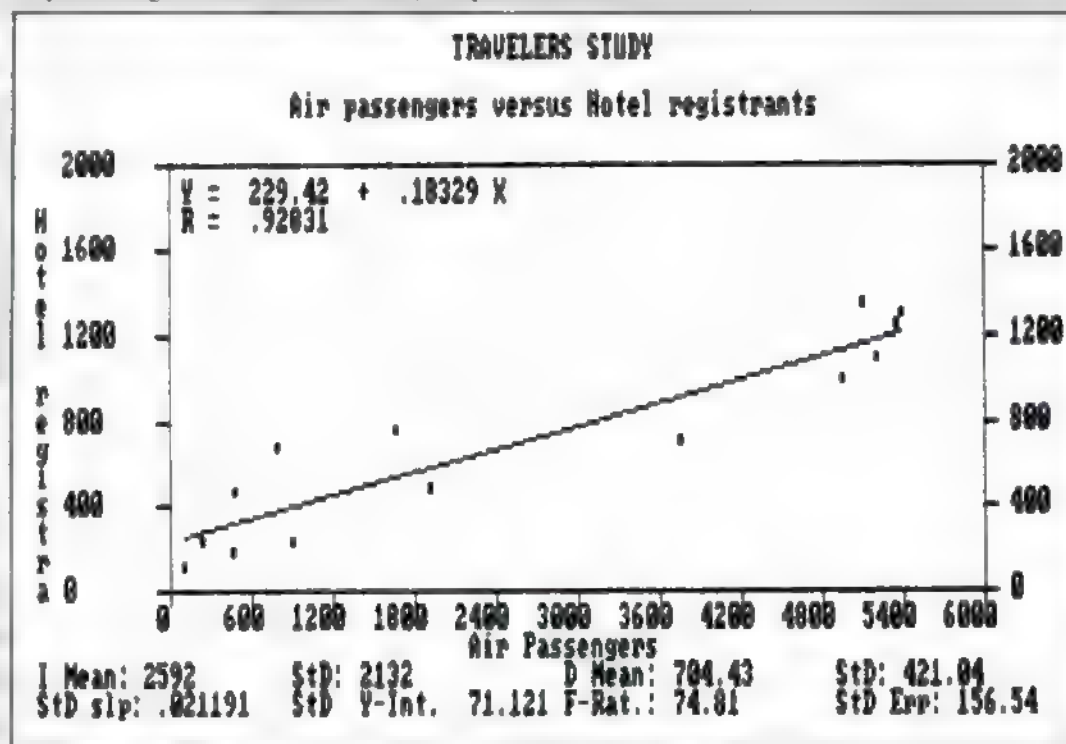


Figure 7: Sample graph showing MCG's X-Y plotting (with trend line) capabilities.



X-Y plots. (The X-Y plot graph is produced using option 7.) After a layout has been selected, each series name is presented in sequence with a request to define the type of display to be used with the particular series. You may choose a mixture of line and bar graphs. The bar graphs may be stacked (see Figure 4), hidden (maximum of two series; see Figure 5) or side by side (see Figure 3). You key your choice by responding G for line graph, B for bar graph, Cn for stacked bar graph (where n is the series number to be stacked on) or P for pie chart (see Figure 6). A series may be omitted from the graph display by responding with a carriage return.

MCG does not allow a pie chart to appear with any other type of graph and two is the maximum number of pie charts

that can be displayed on one graph.

Any graph can be printed on the printer. The sample graphs shown in the figures were produced using the Epson MX-80 printer with Grafrax option. Hard-copy graphs may be produced in different sizes and resolutions. The medium-resolution printer graphs are faster and may be acceptable for draft copies. The medium-resolution option is also used with color monitors. Samples used in this article were produced under the high-resolution option. Printer graphs are produced in format sizes ranging from 5¼ by 3½ inches to 11¼ by 17½ inches. Obviously, because of the size of some of the formats, some graphs require the larger page size of the MX-100 printer.

The trend-analysis option produces a

graph showing the trend line drawn through the X-Y plot of two series (see Figure 7). MCG uses a simple linear-regression model to fit the trend line to the pairwise plot of series X against series Y. The descriptive statistics for each series are displayed on the graph along with the regression statistics used to produce the "least squared" trend line. The independent and dependent variables are defined through prompt responses just prior to the execution of the calculations for the regression. The calculations do not delay the display of the graph.

MCG uses default values for most options and prompts. In most cases, a carriage return will cause the software to select the default value, but the program allows the user to override default



choices. By running through the different choices of graph types, you can see data displayed in different forms (bar, line, pie, etc.) and choose the most visually-effective alternative.

### Shortcomings

MCG's biggest shortcoming is its inability to delete layouts from the database. A confusing and illogical process is required to rid the database of the excess baggage that is certain to accumulate as layouts are added and modified. The only way you can clean up the obsolete and inaccurate layouts is to use the Extract option (menu item 4) to move the "good" layouts to another database. When all good layouts are duplicated in the other database, the old DOS data file containing the good and bad layouts is deleted. Since Extract option transfers only one series at a time to another database, this can be a very time-consuming process. 2Y's Associates plans to add an option in a future release that will give users the option to overwrite an existing layout or create a new one.

It's only a minor concern, but MCG does not provide a way to stop the output to the printer. If you want to print one of the larger graphs, such as one in 11.75- by 17.5-inch format in the high-resolution mode and you need to stop the printer output, it appears that your option is to turn

### Still to Come . . .

Rodney Dobson of 2Y's Associates indicated that Version V2.0, to be released in April, will also allow access to data used by Multiplan and dBase II in addition to that used by VisiCalc and SuperCalc. Mr. Dobson said that version V2.0 provides a command-file capability that

**M**CG SHOULD  
*be a welcome addition  
to most business-  
software arsenals.*

enables predefined graphs to be produced automatically. Up to 50 graphs may be defined in this manner and used in "boardroom type" graphics presentations. According to Dobson, users of version V2.0 will be able to use this capability to send completely-defined graphs to other computers and to remote locations via modem and phone lines. In addition to prompting for printer output, Version 2.0 will prompt the user for output to the HP 7470 and Calcomp 81 plotters. People who own Version V1.0 can upgrade to version V2.0 for \$100.

Also in the development stage is an interface using the Telidon AT&T Standard, for videotext-database storage. The price of the videotext module will be \$85. Dobson expects this option to be available sometime this summer.

### Recommendations

In summary, it appears that Micrograph by 2Y's is an easy-to-learn and easy-to-use product. It produces good high-resolution business graphics. My only reservation in recommending MCG has to do with whether or not you already own a spreadsheet. If you don't you might want to investigate the integrated spreadsheet and graphics software that have recently become available for the IBM PC.

MCG has a few shortcomings as most packages usually do. However, MCG should be a welcome addition to most business-software arsenals. It offers some graphing features that the integrated packages don't have, and it costs less. /PC

**I**T'S ONLY A  
*minor concern, but  
MCG does not provide a  
way to stop the output  
to the printer.*

off the printer. According to 2Y's, the next release (Version V2.0) has a Break command to stop all processing.

Finally, some users may object to the limitation of 24 observations per data series. For instance, investors who use graphics to study trends in stock prices may find this limit unacceptable because 24 data points may not always be sufficient to analyse the trend visually.

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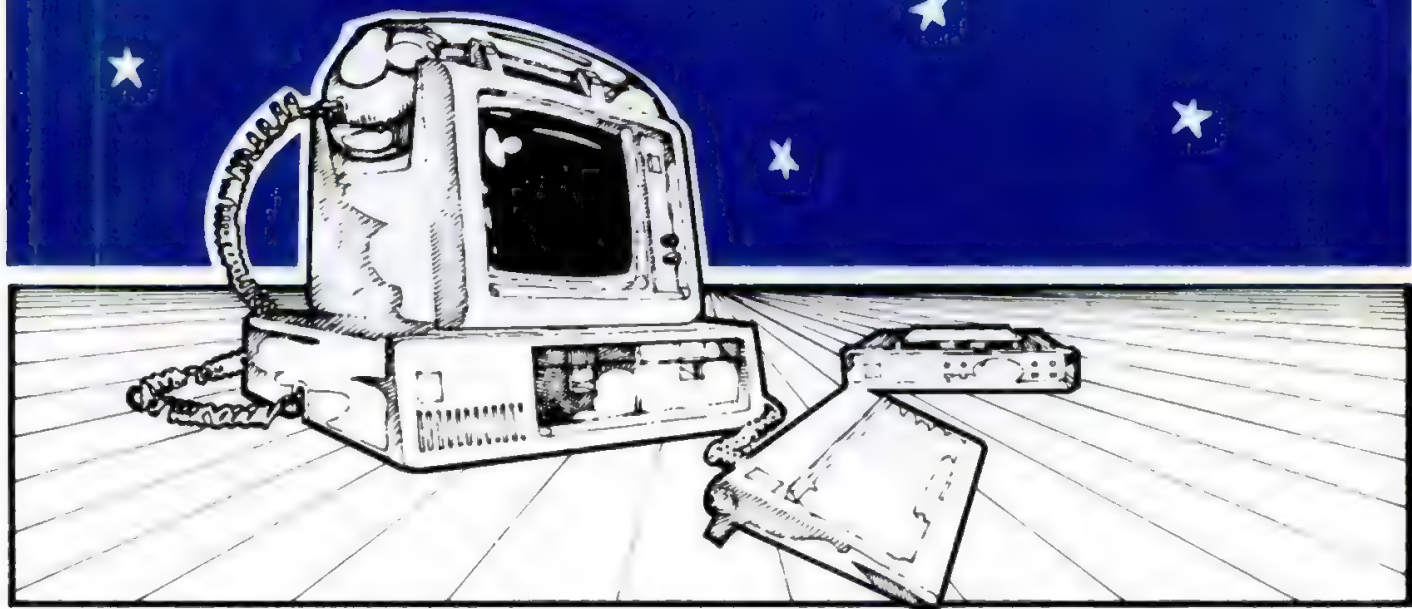
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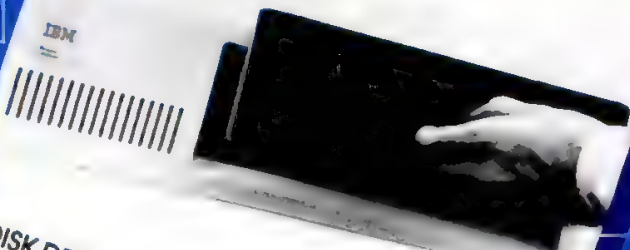
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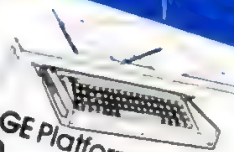
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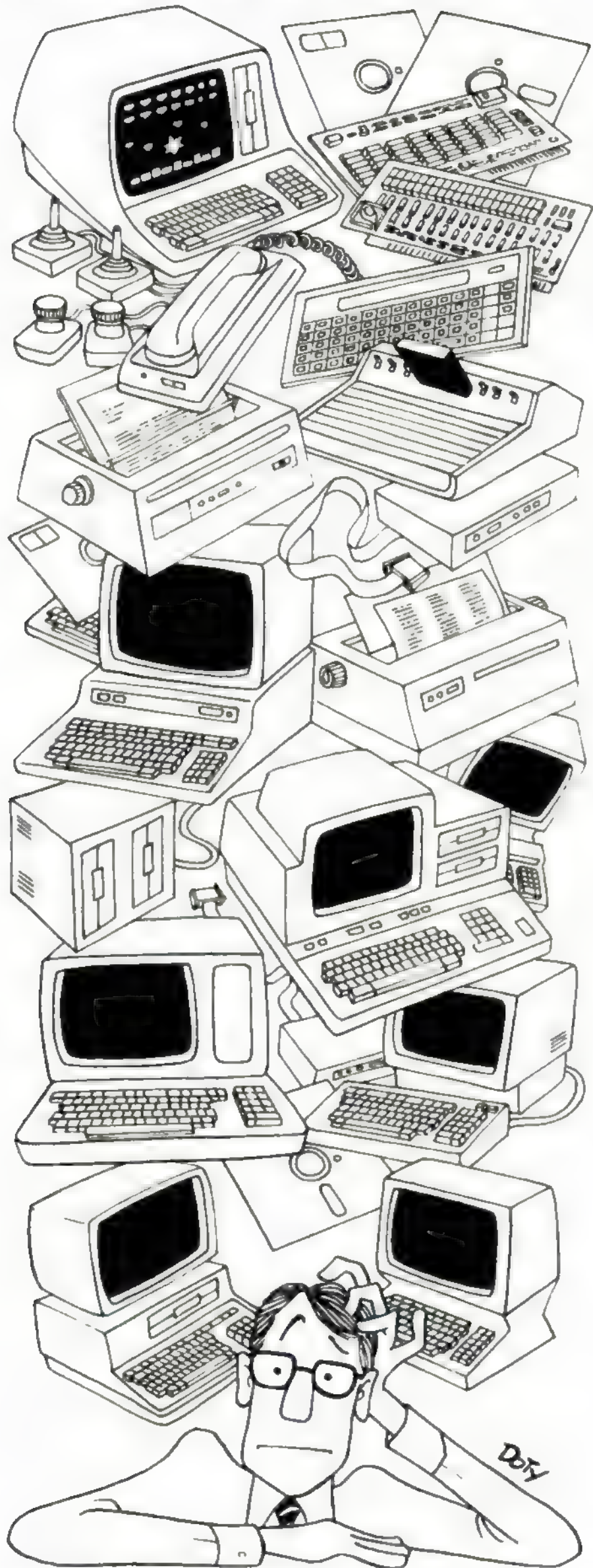
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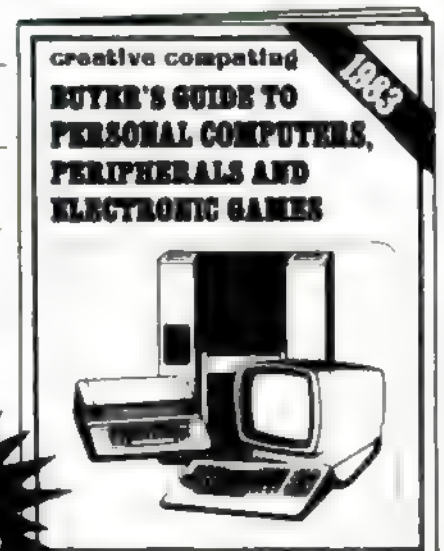
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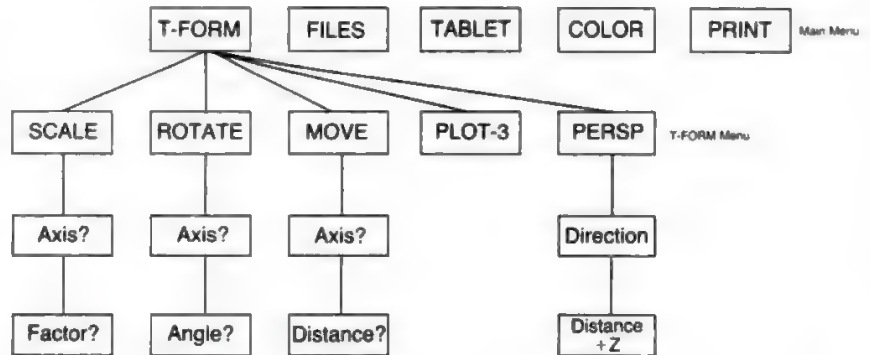




The software's menu-driven system prompts you for all necessary information, beginning with a main menu that provides five options (see Figure 1).

The first option, T-FORM (Transform Menu), allows you to perform a variety of operations, such as scaling (increasing or decreasing an object along any one or all three axes), rotating, and moving. In T-FORM, you can also plot three simultaneous projections from the X positive, Y negative, and Z positive axes, and can view data in any of six perspectives. (Details of T-FORM's menu options are included in Figure 1.)

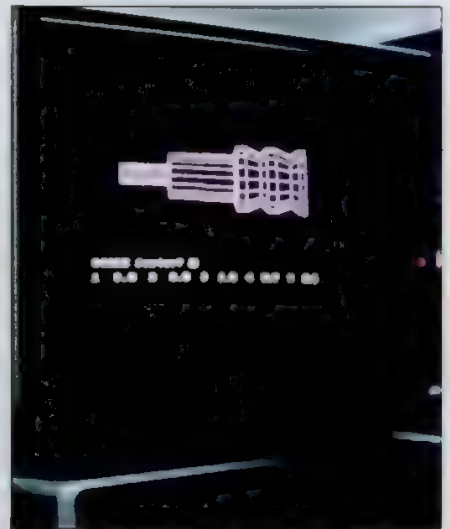
Figure 1: Main menu and details of T-FORM menu for Space Graphics software.



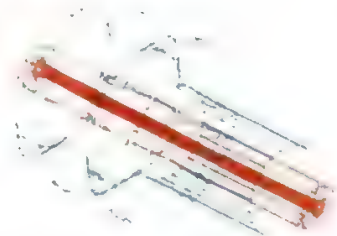
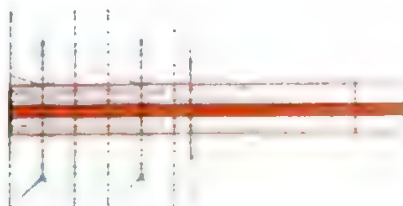
A single ring structure can be colored purple to identify it as an active component. This component can be manipulated independently of the rest of the figure.



The ring structure that was active in the previous display has now been scaled down.



The original image of the pulley has been manipulated by rotating it 90 degrees and by scaling it an arbitrary amount along a single axis.





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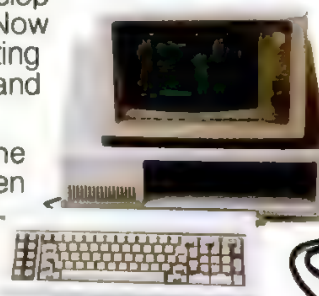
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Main menu option 2, FILES, provides the opportunity to access and edit object files. The coordinates of the points that define a wireframe figure are available from an ASCII file. With option 3, you can control the Space Tablet itself in order to perform digitization. The fourth option, COLOR, allows you to add four colors (green, violet, white, and black) to a given picture. PRINT, the fifth option, dumps figures drawn on the screen onto an Epson MX-80 or MX-100 printer.

The main menu, and the subsequent menus, make maximum use of the function keys on the PC keyboard. You do not have to type in the full name of an option or remember its letter code since each option is described on the screen and may be selected by pressing a single function key. Pressing the Enter key or F10 at any time will return you to the main menu.

#### Advanced Software

The most recent version of Advanced Space Graphics software gives the Space Tablet new capabilities. You can design, digitize, and automatically dimension the wireframe objects that the Space Tablet generates.

**A**DVANCED Space Graphics software allows you to design, digitize, and automatically dimension the wireframe objects that the Space Tablet generates.

erates. MCS software can also manipulate data generated by keying in coordinates or by using two-dimensional tablets.

Using Advanced Space Graphics software, you can duplicate existing components or develop mirror images of them. You can also draw arcs and circles and stack the circles to generate cylinders and cones with surfaces of revolution. Some programs can be used to construct a wire-

## Look! Up in the Sky! It's 3-D!

*A three-dimensional image created and stored with the Advanced Space Graphics software can be manipulated at will. These plotted pictures of a horned head flying over a field of squares are the same image as seen from different viewpoints in space.*

Figure name: head  
Figure name: eyes  
Figure name: horns  
Figure name: field

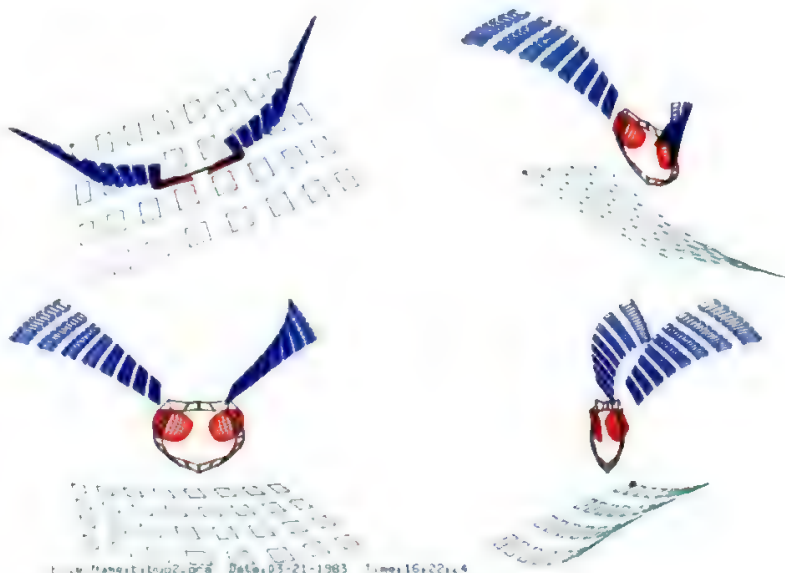


Figure name: head  
Figure name: eyes  
Figure name: horns  
Figure name: field







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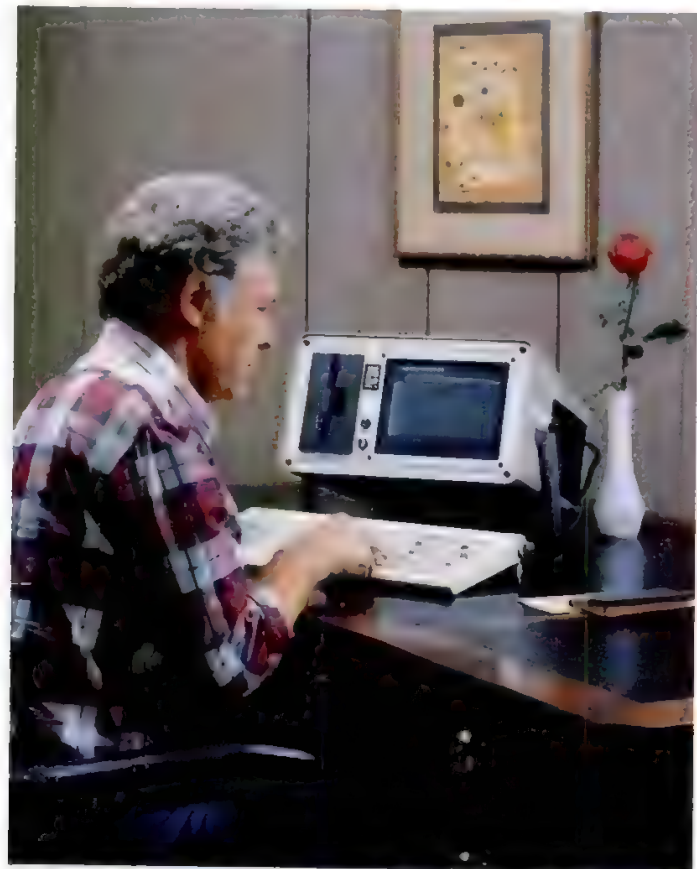
**RSVP.** Please write to us for data sheets and ordering information (prices are introductory offers, subject to change without notice). If you missed seeing the Colby PC-1 in action at Comdex '82, visit us at the Eighth West Coast Computer Faire (San Francisco, March 1983).



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frame object, display it from the top, side, and front, and add text to it. Other programs can draw angles or lines in five ways, and allow you to watch them change as you alter the drawing. Ad-

## **D**ELSON *digitizes the skulls of fossil monkeys to study the evolutionary relationships between different species.*

vanced Space Graphics software can be used to drive plotters as well as printers, such as the IBM XY/750, the Hewlett-Packard 7470A, and the Houston Instruments HI/PLOT.

MCS also markets a *Space Communications* software package that can transmit three-dimensional drawings through telephone lines to other users.

### **Digitizing Skulls**

Interactive three-dimensional input, as provided through the Space Tablet, is an effective method of modeling irregular surfaces that cannot be represented through the mathematical equations most software can perform. Dr. Timothy Hart, a prosthodontist from Kenosha, Wisconsin, uses the Space Tablet for cephalometric analysis, the measuring of a patient's jaw and skull for orthodontic purposes.

The Space Tablet's ability to digitize skulls also plays an important role in the anthropological studies conducted by Eric Delson at the American Museum of Natural History in New York. A research associate in the Department of Vertebrate Paleontology, Delson digitizes the skulls of fossil monkeys to study the evolutionary relationships between different species. He plans to use this data to date the sites from which the fossils were taken.

### **Laser Cutting**

Gamata Corporation uses the Space Tablet as a supplement to its own PC-based laser cutting machinery. Gamata's client, a plastics manufacturing shop, had

used traditional methods to cut, modify, and assemble plastic parts prior to its adoption of the laser cutting tool. The old procedure required laying out patterns on sheets of flat plastic, which were then cut with hand tools; completing these parts used to take about one week. Following the implementation of the PC-based system, however, the typical cycle time was reduced to less than one day.

The primary benefit of the PC/Space Tablet system is that it allows direct interaction between the product designer and the completed part. The product designer can now construct the part in three-dimensional detail on the RGB monitor, create a test volume sample, and look for any changes in dimensions that indicate interference. The modeled cut files can then be saved on disk and sent to the laser cutter, where parts can be cut immediately.

### **Engineering Applications**

One of the primary applications for the Space Tablet/Space Graphics system is in engineering design.

Russell Berger, an acoustical engineer with Joyner-Pelton-Rose, Inc., of Dallas, Texas, has been using the system to design public address systems. Berger must assemble a cluster of speakers and horns that will direct sound at a certain pressure level to a specific seating area. He predicts the sound field and chooses horns that will provide the proper sound coverage. Sometimes 20 or more different horns are required; each must be rotated into its respective X, Y, and Z axis position above the floor, and then assembled into a cluster.

To simplify this procedure, Berger uses the Space Tablet's software to call modeled horns from a file, either individually or together. The horns are then scaled, moved, or rotated into their proper positions. Next, Berger prints plan and section views, using the Tablet to determine the proper acoustical shape of the audio control room, a critical factor in obtaining good audio reproduction.

### **Educational Applications**

The Space Tablet/Space Graphics system is also being used to introduce students of all ages to computer-aided design (CAD) on microcomputers. The system is gaining acceptance at colleges and universities as a means of introducing students to quantitative and qualitative CAD. Sev-

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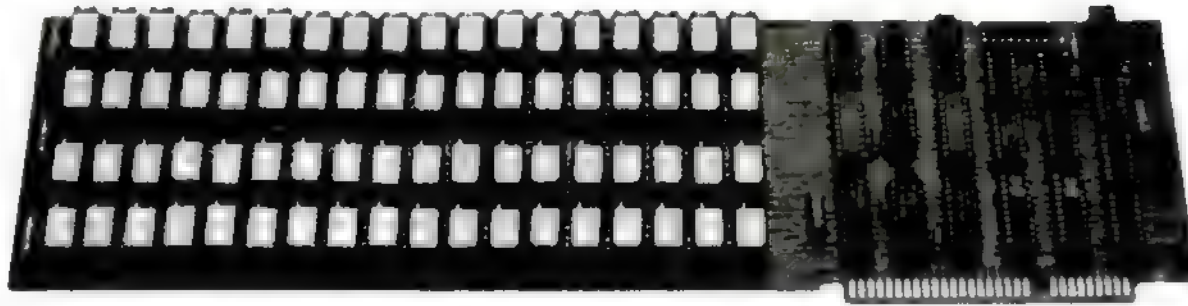
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eral high schools are also using the system to produce CAD simulations.

Robert Silverman, director of Industrial Arts and Home Economics for the Northport School District of Long Island, New York, sees the Space Tablet as a means of acquainting high school students with a technology they will use in the future. He wrote a 40-page workbook that instructs students in the operation and application of the Space Tablet; it relates their experiences at each step to what might be encountered in an industrial level CAD problem.

Silverman rotates each student from his regular class into a week-long CAD simulation program and checks the progress of each student by reviewing printouts of each one's wireframe drawings. "It's an excellent way to prepare students for the future of industrial design, and it extends the concept of computer literacy to graphics as well," Silverman said. He added that schools can obtain federal grants for this purpose through the Federal Vocational Education Act (94-484).

College students are using the Space Tablet/Space Graphics system as a conceptual tool for computer-aided design and as an analytical tool for molecular modeling, cell structure analysis, mathematics, and medical mapping. At the Systems Science Institute at the University of Louisville, Kentucky, the system is used

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## GAMATA

***Corporation uses the  
Space Tablet as a  
supplement to its own  
PC-based laser cutting  
machinery.***

---

to introduce graduate students to conceptual design.

Ken Powell, chief executive officer of Etude Concepts, an executive seminar workshop in Chappaqua, New York, uses the Space Tablet to teach executives about the technology of the future. "We like to give executives an example of what's coming down the line in technology," Powell



said, "The Space Tablet lets them interact with computer graphics in short order. We've been pleasantly surprised as to how far they can actually go with it."

#### The 3-D Future

The Space Tablet/Space Graphics sys-

**T**HE SPACE Tablet/Space Graphics system is also being used to introduce students of all ages to computer-aided design on microcomputers.

tem has made the PC into a capable tool for many applications that were previously outside its reach. In developing this advance in microcomputer technology, Livingston Davies and Peter Smith of MCS were guided by two concepts.

The first is that most people find it more natural to think in 3-D. Up to now, engineers, architects, scientists, and artists were limited by having to represent their ideas in only two dimensions. The MCS system now gives them the opportunity to recreate their three-dimensional ideas and materials digitally and work with them in a computerized form.

The second concept is that microcomputers can perform very sophisticated graphics and information processing. The Space Tablet has made good on this belief by providing a capability for microcomputers that did not exist before.

The PC is starting to be taken seriously in fields such as computer-aided design, thanks to successful pioneering at MCS. Remember the effect that the introduction of VisiCalc had on the use of personal computers in business. Now that the PC has broken into the third dimension with the Space Tablet, we can imagine a different future for microcomputer graphics, shaped by MCS and its coming competitors.

/PC

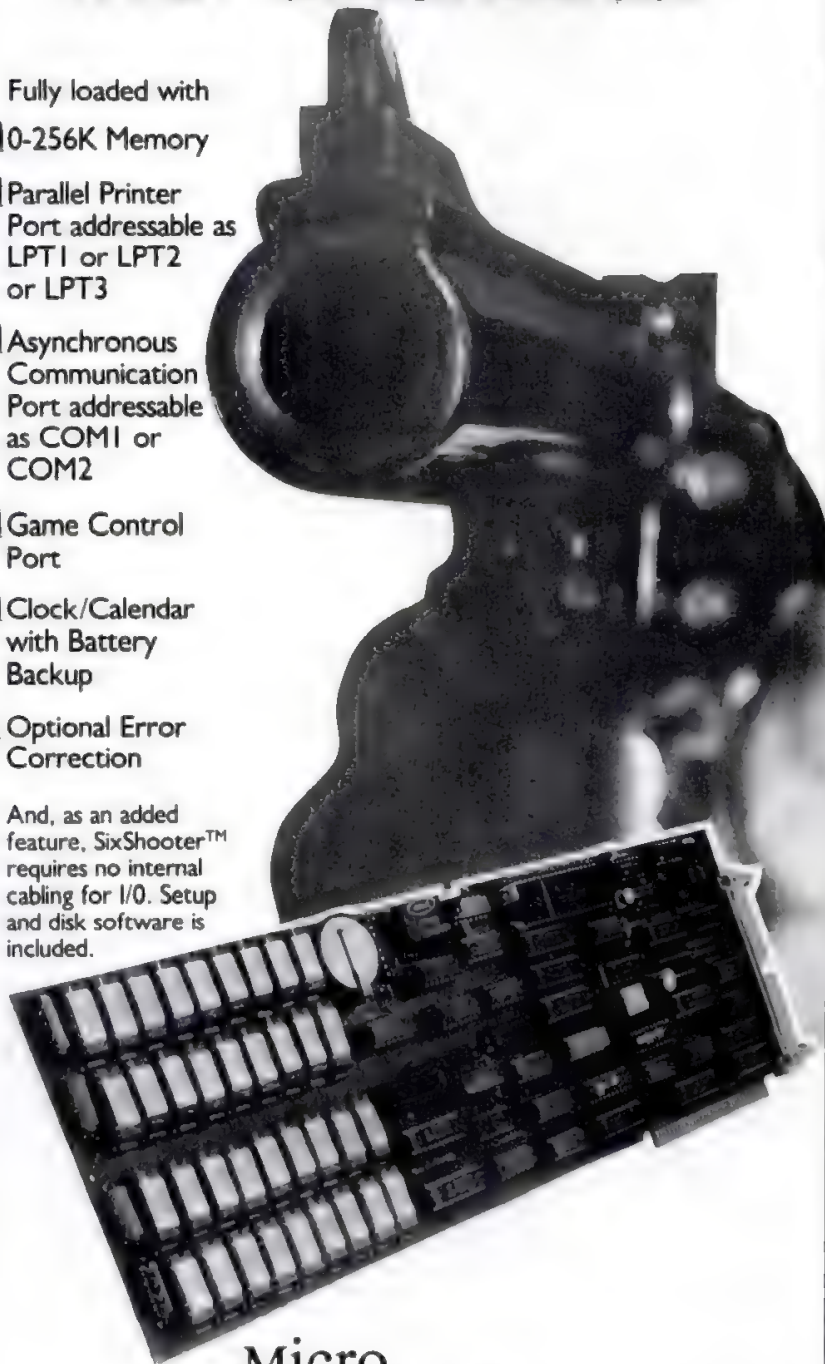
Barbara Luke Solsky is a New York City-area free-lance writer and editor.

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As you well know, the IBM Personal Computer is proving to be the success story of the 1980s. Only 18 months after its introduction, the IBM Personal Computer commands almost a fifth of all personal computer sales—a remarkable achievement. At present the number of IBM Personal Computers in users' hands exceeds a quarter-million, with perhaps as many as half a million on the way in the next 12 months.

But despite its widespread public acceptance and the wealth of products now available to support it, we are convinced that *vast areas of its potential remain unexplored*, not to mention those products waiting to be introduced for which the IBM Personal Computer is the precursor.

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We consider you to be among that select group of readers. Your relationship

with microcomputers, vocational or otherwise, has led you to levels of technical competence and curiosity which go far beyond problem-solving. In effect, you have a compelling interest not only in *what* your IBM Personal Computer does, but also *how* it does it and how it can do more.

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- *Detailed examinations of component hardware available for the IBM Personal*

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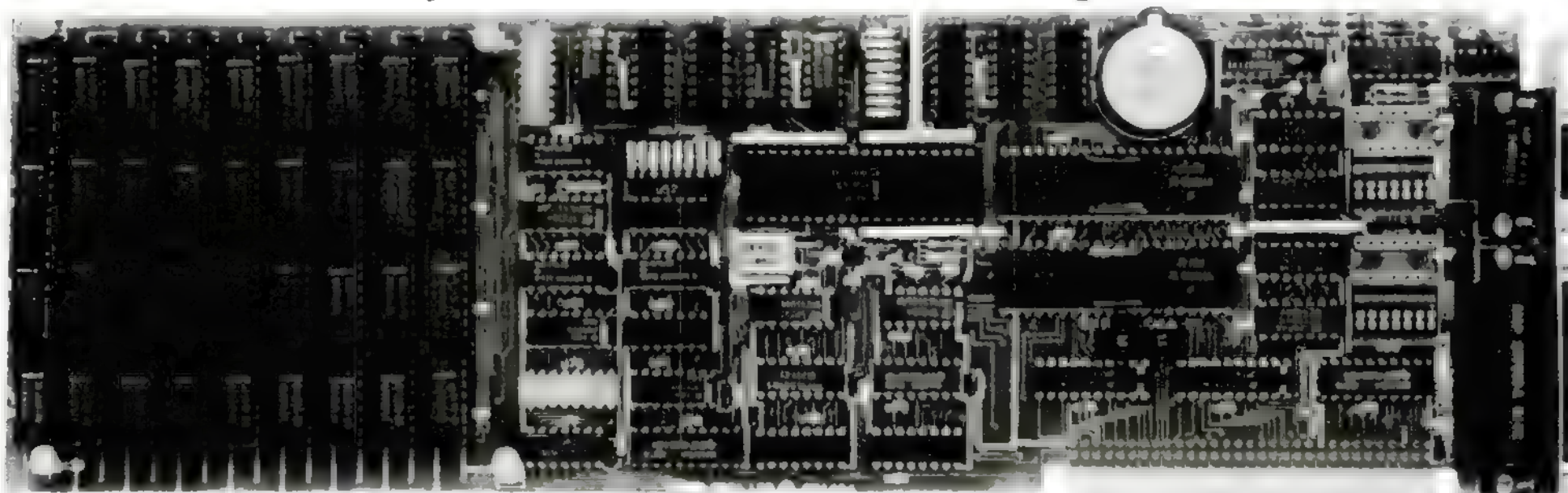
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Comprehensive documentation is provided with numerous illustrations to simplify installation procedures. All documentation fits neatly into existing 3-ring binders provided with the Personal Computer.

Each PDI464 is "burnt-in" at elevated temperatures and fully tested. Packaging material provides protection from static and mechanical shock during shipment to further ensure reliability. The PDI464 is covered by a one year limited warranty.

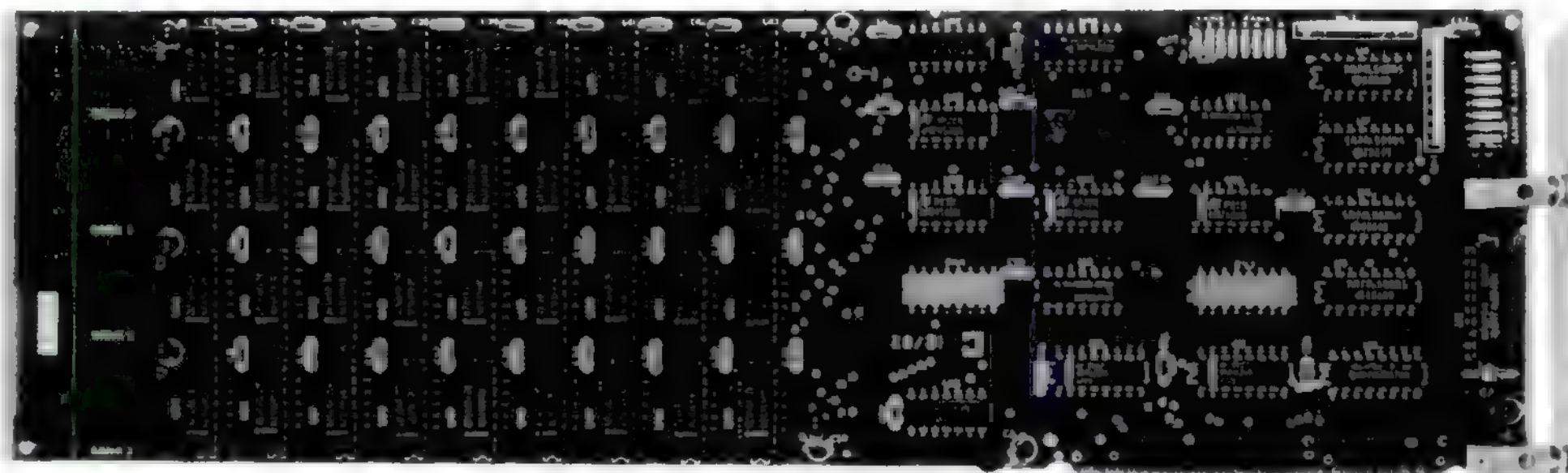
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- Step by Step in English •
- Handy Reference Guide •

PLAN POWER-Visicalc	75	59
PLAN POWER-Supercalc	75	59
PLAN POWER-Multiplan	75	59
DB POWER-dBase II	75	59
POWER PACK-Wordstar	75	59
ATI POWER-IBM DOS	75	59
BASIC POWER-IBM MBASIC	75	59

### MODEMS

SIGNALMAN Mark I (RS232)	List	ACP
HAYES	\$99	\$79
Smartmodem (RS232)	289	225
Smartmodem 1200	699	549
IBM PC to Modem Cable	40	30

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TANDON TM-100-2 . . . . .	299
SHUGART DSDD (12" high) . . . . .	299
QUME DSDD (12" high) . . . . .	299

(External Case and Power Supply Also Available)

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<b>IBM</b>	List	ACP
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Color to Mono I/O Module	95	85
Telephone Receptionist adapt	995	875
PS3276/Bisyn Emulator	1295	1150
<b>AMDEK Dual 3" Amdisk</b>		
(2) Hitachi DS (250K)	899	649
<b>AST Megaplus™ Card</b>		
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P/N MG-064SP, add'l Ser. Par	695	499
P/N MG-256, 256K Ser. Clk	995	749
P/N MG-256SP, add'l Ser. Par	1095	749
<b>AST Communications</b>		
AST-3780 Bisync/SDLC/HDLC	945	799
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<b>AST I/O Plus™ Card</b>		
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<b>AST Combo Plus™ Card</b>		
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<b>AST PC Disk+™ Card</b>		
P/N MC-054, 64K Host, Par	655	495
<b>CACTUS TECHNOLOGY</b>		
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<b>COEX</b>		
Extender Card	40	19
Prototype Card	89	42
37 Pin "D" Connector	19	8
Snap-in Card Guides (5)	8	5
<b>CORONA Hard Disk System</b>		
<b>CORVUS Hard Disk System</b>		
<b>DAVONG</b>		
5Mb Hard Disk	1995	1490
12Mb Hard Disk	2495	2295
<b>MAYNARD Disk Drive Card</b>		
Floppy Card w/Parallel	295	249
Floppy Card w/Serial	325	260
<b>ORCHID</b>		
Hi-Res Graphics Adapter	495	429
<b>PERSYST Spectrum (64-256K)</b>		
P/N SP54-CCP 64K S, S, P	499	
P/N SP64 64K	375	50
64K Upgrade Kit (9 chips)	130	50
<b>QUADRAM Quadboard (64-256K)</b>		
P/N Q64 64K w/4 Functions	595	429
<b>TANDON TM 100-1 (160K)</b>	295	195
<b>TANDON TM 100-2 (320K)</b>	395	289
<b>TG PRODUCTS</b>		
Joystick	65	40
Track Ball	65	52
<b>VISTA "Multicard"™ (exp. 64-256K)</b>		
P/N V-064, 64K	395	249
P/N V-064PSC 256K w/PSC	495	289
64K Upgrade Kit (9 chips)	50	50
"MAXICARD" 576K	1295	999
"PC MASTER"™ 7 I/O's	495	495
DISKMASTER™ handles 5 1/4", 8" and Cartridge Floppies	349	249
<b>XEDEx Baby Blue CP/M</b>	600	445

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<b>COEX 80F/T 80cps</b>	\$499	\$299
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Gemini 15 15	649	479
<b>OTC Daisywhl w/48K Buf</b>	1450	1049
<b>EPSON MX80</b>	645	429
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FX80	699	549
<b>INTEGRAL DATA</b>		
Microprint 480	799	689
Prism 80 Color (alt)	1795	1495
Prism 132 Color (alt)	1995	1685
<b>BROTHER HR-1</b>	1195	895
Daisywriter	1495	1295
<b>IBM PC to EPSON Cable</b>	60	45
<b>OKIDATA Microline 82A</b>	599	489
Microline 83A	899	729
Microline 84AP	1399	1099
Okidata 92	699	549

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<b>AMDEK CORP.</b>		
300 Green 12"	\$199	\$155
310 Amber 12"	210	175
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<b>MAXELL MD1 SS</b>	10/50	29
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<b>Flip Box 5 1/4" (80 disks)</b>		14
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dBase II for PC-DOS 128K	700	445
<b>APPLIED SOFTWARE TECHNOLOGY</b>		
Versaform	390	259
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<b>COMSHARE TARGET</b>		
Target Planner Calc		Call
<b>CONSULTANT SYSTEMS</b>		
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<b>DATAMOST</b>		
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Write-on IBM	130	89
<b>DENVER SOFTWARE</b>		
Executive Acct Sys (easy)	725	555
<b>EAGLE SOFTWARE</b>		
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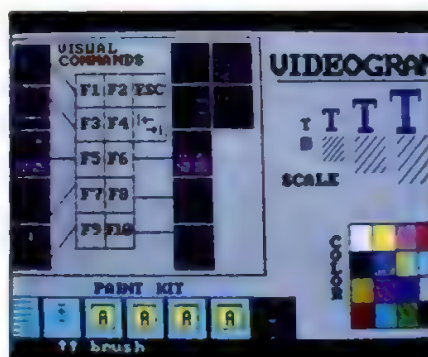
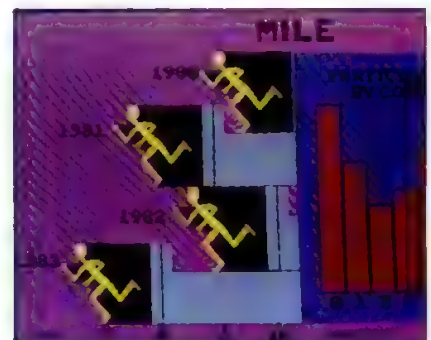
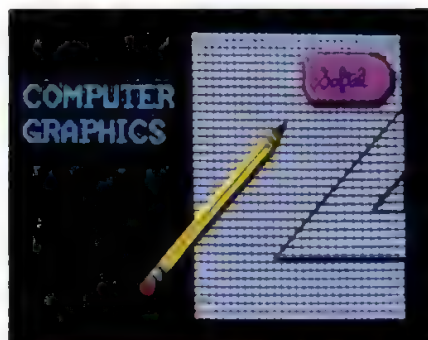
**Requires:** 64K, one disk drive,  
color monitor.

CIRCLE 592 ON READER SERVICE CARD

Computers are capable of producing extraordinary graphic images. We've all probably seen the riveting NASA pictures of Saturn and Jupiter, or the surreal computer animations in recent films and television commercials. While these impressive visuals have been created on large mainframes, the technology is rapidly sifting down to smaller systems.

The ability of a microcomputer to handle graphics is becoming an increasingly important consideration for prospective purchasers. Most businessmen agree that charts and graphs can communicate data with far greater speed and impact than tables of figures. And computers can produce slides and attention-getting figures that add life to staid presentations at sales meetings and trade shows. Architects, engineers, and designers of all sorts are learning to use their PCs to help create and sell their products.

IBM originally brought out the PC with two boards: one for monochrome moni-

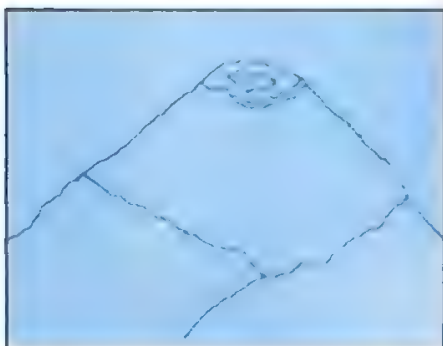


tors and the other for either a television type monitor or a high-resolution RGB monitor. Both boards can handle graphics, but while the color board can build up complex images dot-by-dot, monochrome graphics must ordinarily be constructed entirely from ASCII characters (primarily the special high-bit graphics set with ASCII numbers from 128 through 255).

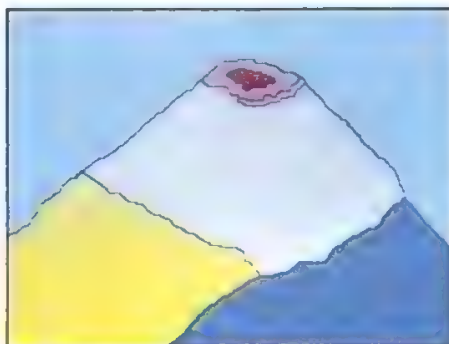
However, two hardware suppliers, Hercules Computer Technology and Orchid Technology, each manufacture special monochrome graphics boards that allow high-resolution pixel-by-pixel graphics on the monochrome screen, and a new generation of boards that can handle both color and monochrome graphics is starting to hit the market.



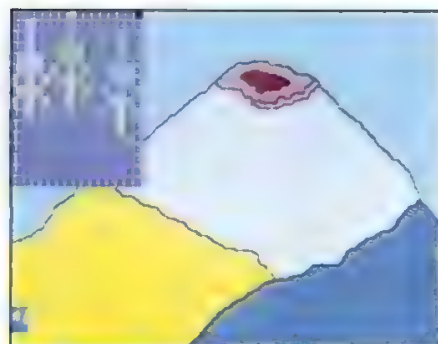
# 100,000 BITS



An outline of the volcano is drawn in one foreground color on a different background color.



Five additional foreground colors are painted on.



Trees are created using the zoom feature that allows pixel-by-pixel color manipulation.



The initial tree grouping is moved and copied to other parts of the image.



Additional groups of trees, the outline of a smoke cloud, and a line drawing of the fire tower are added.



The outline of a smoke cloud and a line drawing of the fire tower are added.

## Addressing the Issue

While there has been a proliferation of new graphics hardware such as better graphics boards, cheaper high-performance monitors, and a wealth of input digitizing devices, graphics software has lagged far behind. Some of this is the

result of the relative difficulty in graphics programming. BASICA and Pascal provide many graphics functions, but these are fairly slow and often hard to use. Drawing a complicated image often requires tedious dot-by-dot or segment-by-segment addressing. And for certain ad-

## Image Processing

This sequence of screens shows the steps involved in creating a composite image using Videogram software and the Plantronics color board.



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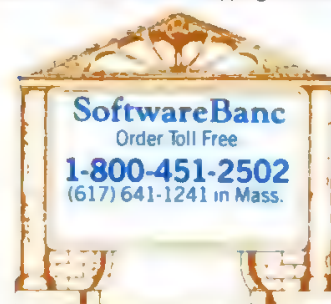
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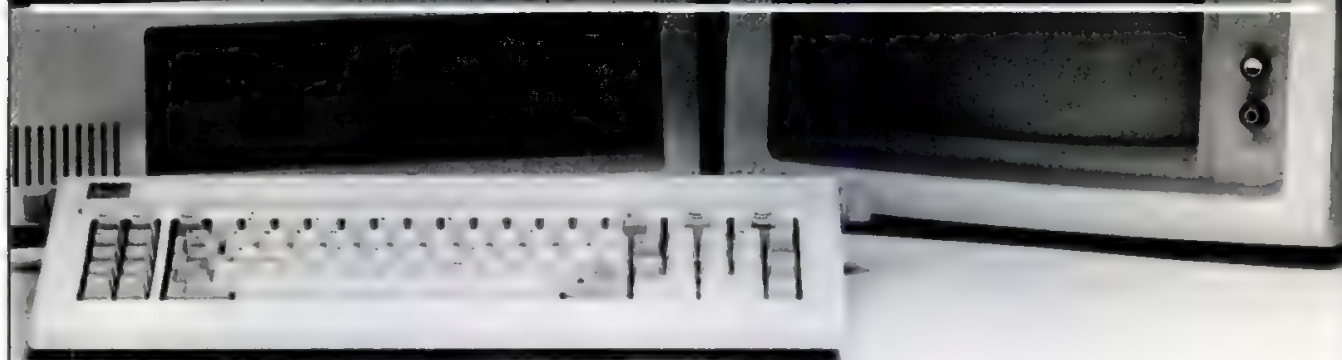






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CIRCLE 105 ON READER SERVICE CARD

vanced applications, the programmer must know how to access such graphics controller chips as the IBM's Motorola 6845 directly.

Many viewers of commercial television feel that certain well-produced commercials have far more visual impact than the programs surrounding them. The producers of these commercials know the value of dazzling computer graphics and animation—they want to glue you to your seat so you don't scurry off to the refriger-

taneous colors, designed for text and primitive text graphics; the other with either a 40-character screen and a maximum of 4 colors or an 80-character screen in black and white, designed for true dot-by-dot graphics. The maximum resolution the PC can handle is 640 horizontal dots by 200 vertical dots, in one color against a black background. However, for true pixel-by-pixel color graphics, the PC hardware can deliver only 320 horizontal dots by 200 vertical dots and only 3 colors at one time (on top of one of 16 background colors).

In the 80-character text mode you can work with 16 different colors, but can display only combinations of the 256 ASCII characters stored in the PC's ROM. Although it is possible to use so many colors simultaneously, you can't address individual pixels on the screen. Another drawback is that in the IBM text mode you can't use any of the graphics commands and statements built into Microsoft BASIC, such as the ones that draw circles or boxes or even simple diagonal lines.

### Playing with Building Blocks

The text screen can manipulate 256 separate characters, and create images by using these characters as pictorial building blocks. You can draw several kinds of boxes and grids with little pieces of horizontal and vertical lines and the various intersections of such lines with the present character set. You can also use several rectangular shapes in combination with these lines to form complicated pictures. You can even use strings of certain letters and punctuation marks to create interesting pictures. But you are still constrained by the limited number of character building blocks available.

There are several commercial programs that allow you to create and store your own graphics-mode characters. These become new picture building blocks, and can be manipulated directly from the keyboard. The characters can easily be moved in BASIC programs by turning them into CHR\$ strings and using the LOCATE statement to change their positions onscreen. However, you can do this only in the graphics mode, which limits you to three foreground colors. And since the PC prints all text in either white or yellow, and these custom-made character sets are treated like text, you can't use them with very much impact.

**N**EW ADD-ON boards can produce animations that would have turned heads two or three years ago.

ator. And they have the resources to hire the most talented computer artists and the best-equipped graphics studios.

With a properly equipped system, any IBM PC user can produce images of impressive quality, capture them on color slides, and use them for advertising or display purposes. New add-on boards from companies such as Tecmar can even put successive screens onto individual videotape frames, producing animations that would have turned heads two or three years ago. But none of this is very easy at present. There are few decent graphics utility software packages on the market. And IBM-supplied hardware simply can't handle ultra-high resolution and hundreds of colors on the screen at once.

### Learning the Vocabulary

When IBM put together its first color graphics board for the PC it did a minimal job. Rather than produce hardware that would let users create Tron-quality images or the rapid animations used in television commercials, the Boca Raton design team assembled a board that let home users experiment to learn the vocabulary of computer graphics, and allowed businessmen to draw relatively uncomplicated bar graphs and pie charts.

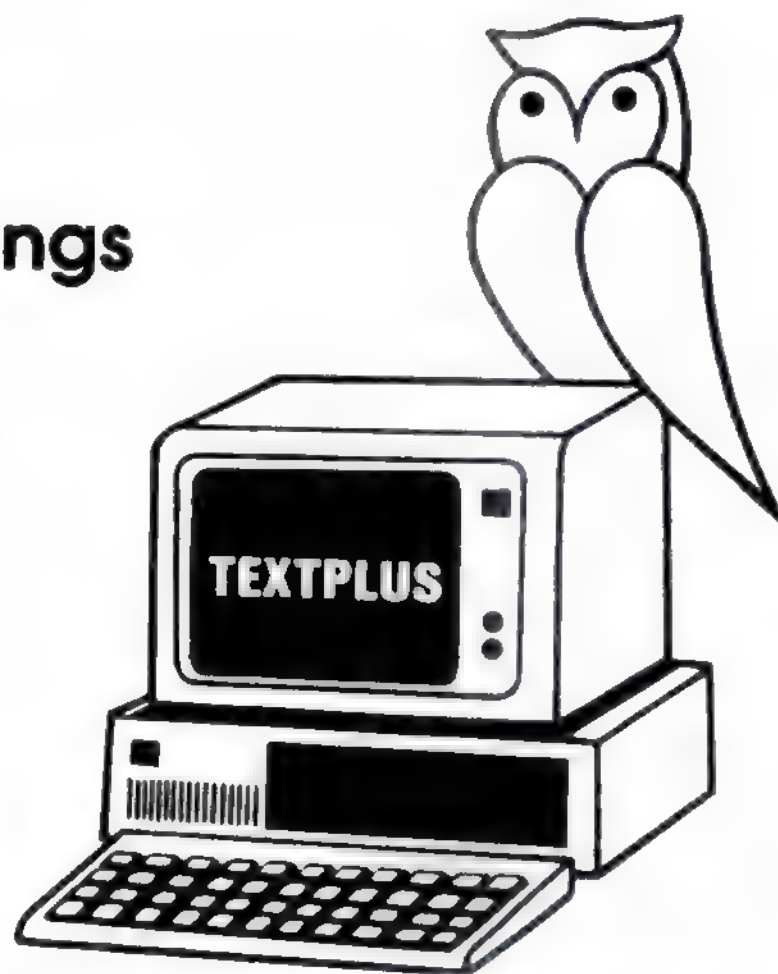
The IBM color graphics board operates in two modes: one with an 80-character screen width and a maximum of 16 simul-



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A better trick is to decrease the number of dots you have to work with on the screen and at the same time increase the number of colors. What you sacrifice in the number of dot locations, you gain in the number of colors you can assign to each dot. The current IBM color graphics card can handle only 16,000 bytes of active screen memory. Since there are eight bits to a byte, you can work with a grand total of 128,000 (16,000 × 8) pieces of color and positioning information. This number sounds large, but doesn't actually amount to very much.

In the high resolution mode, which uses 640 pixels from left to right and 200 from top to bottom, you need all 640 × 200 bits of memory. And since each of these binary bits can only be turned off (=0) or turned on (=1), any high-resolution image can have only one foreground color against a black background color. While the IBM graphics board normally makes this foreground color white, you can give it any color you want by entering OUT 985,N where N is a number from 0 to 15 in IBM's color system.

The medium-resolution screen uses only 320 dots from left to right but the same 200 dots from top to bottom. Multiply 320 by 200 and you get 64,000, which is half of the available 128,000 bits of memory. The other 64,000 bits are used to put color on the screen, but you're limited to one of three foreground colors and one of 16 background colors. There simply isn't enough room to code more than that into the limited screen memory space

***YOU'RE LIMITED  
to using two groups, or  
palettes, with three  
colors each; these color  
combinations don't  
exactly send graphics  
artists into shivers of  
ecstasy.***

available. And IBM's medium resolution color selection is not the best. You can use only two groups, or palettes, with three

colors each, and these color combinations don't exactly send graphics artists into shivers of ecstasy.

### **Painting by the Numbers**

The reason for this is in the way IBM coded its colors. Its spectrum is only eight colors wide, and two of these colors are white and black. Ignore those and you're left with six. (Actually, each color can be

***T*****O MAKE  
matters confusing, IBM  
calls bright, high-  
intensity colors "light"  
colors.**

displayed in high or low intensities, so you really have twelve colors plus two shades of black and two of white. The high-intensity white is so overpoweringly bright that you really can't do much with it, and the low-intensity black is effectively invisible.) The six basic colors are coded: 1=blue, 2=green, 3=light blue (which IBM calls "cyan"), 4=red, 5=purple (called "magenta"), and 6=brown.

This last color, brown (#6), is actually the low-intensity version of color #14, which is yellow. You can figure out what the high-intensity version of any color is by adding 8 to it. High-intensity red is color 12, since red is color 4. To make matters confusing, IBM calls these bright, high-intensity colors "light" colors. So the IBM BASIC manual calls color 9 "light blue" (remember, regular old blue is color 1). But color 9 is just a jazzed-up, brighter version of blue. On a precisely tuned color monitor such as IBM's own, the light colors do look a bit less rich or deep than the regular colors. But on most other screens the light colors look brighter and far more intense. And if your monitor can't read the intensity signal that governs character brightness, you won't see any difference. Color 1 will look exactly like color 9; color 2 exactly like color 10, etc.

In the medium resolution mode, however, you can't create images using the high-intensity colors. You can use both the high-intensity colors and the ordinary-



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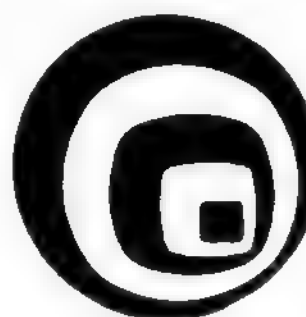
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intensity colors only in the background. But for foreground colors—the ones you draw or paint with—you are stuck with either green, red, and brown (colors 2, 4, and 6 on IBM's palette 0); or cyan (light blue), magenta (purple), and white (colors 1, 3, and 5 on palette 1). You can't mix palettes, so there is no way to draw a red line next to a blue line on the same medium resolution screen. Artists creating complicated images must find ways to use these limited and bizarre color schemes without having the result resemble a sixties psychedelic phantasmagoria.

Programming experts and tweak freaks have gotten around this stricture by using an additional mode, not mentioned in the BASIC manual, that gives users 16 colors and the ability to manipulate pixels

know how to program the Motorola 6845 CRT Controller chip on your graphics board. The IBM Technical Reference manual adds that "many additional modes are possible with clever programming of the adapter [card]."

### Out of the Water

Most businessmen aren't interested in anything except punching a button or two and having the screen fill with eye-popping graphs, charts, and message slides. And to paraphrase Willie Sutton, that's where the money is. While hardware vendors may bring out devices that would let programmers fiddle with more colors or higher resolution than is currently available from IBM, the big thrust at the moment is to produce equipment aimed at business use.

Enhanced business graphics are often referred to as "presentation graphics," since such images are used primarily as electronic slide shows at corporate sales or organizational meetings. A computer with sophisticated presentation graphics can switch from image to image using such cinematic tricks as dissolves and wipes, and can display logos and sales points with attention-getting highlighting and animation. A well-done presentation graphics program can blow conventional flip charts out of the water, and provoke applause for its technical virtuosity.

One of the most significant new areas of microcomputer development is likely

**YOU CAN USE combinations of letters and punctuation marks to create interesting pictures.**

to be in presentation-quality graphics. Most small-to-average businesses, and even many larger ones, simply do not have professionally staffed art departments that can produce standard ink-and-paper images of sufficiently high quality. But with advanced hardware and software, virtually any patient PC user can achieve impressive results using preset templates and advanced one-key commands.

Third-party hardware vendors have recognized that such dazzling displays were not really possible with the IBM color/graphics board, because of its limited resolution and the difficulty in working with only three colors locked into two inflexible palettes. The first non-IBM manufacturer to offer a more advanced board was Frederick Electronics. Its Plantronics Colorplus board fits in one PC expansion slot but acts like two overlapping IBM color graphics boards.

The Plantronics board has the same

## THE BIG THRUST at the moment is to produce equipment aimed at business use.

directly on the screen. The IBM Technical Reference manual calls this the "low-resolution" mode, because you are limited to 160 horizontal and 100 vertical pixels. (Each low-res pixel is actually a 2-by-2 box of dots.) To use this feature, you must

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320 by 200 resolution as the IBM board, but can put all of the PC's 16 colors on the graphics screen at one time. It originally sold for \$995, but was reduced first to \$750, and more recently to \$475. While this may have been partly motivated by increased competition, an executive at Plantronics said a new fully automated manufacturing system, plus a tremendous

**T**HIN LINES actually do appear to quiver on the screen as the image alternates between the odd-numbered and even-numbered lines.

number of orders in the pipeline, let them slash the price. He also predicted that prices for all manufacturers' color boards would continue to plummet, and added that manufacturers are scrambling to cram all the necessary circuitry onto one chip and soon may offer 16-color high-resolution graphics boards for as little as \$150.

Control Systems currently sells two ultra-high quality single-slot boards for the PC that can yield either 640 by 410 dots (its \$1,595 version) or 1,024 by 1,024 dots (for a whopping \$3,195). Its boards, as well as a new board from Scion, have analog outputs, and require special compatible monitors selling for \$2,000 and up. Images produced with such expensive analog hardware on a micro system can be extraordinary. Improved lower-resolution digital boards have been announced by Quadram, Tecmar, Amdek, USI, and AST. Conographic Corporation's board will have IRGB digital, RGB analog, true NTSC, and channel-selectable RF outputs. And yes, one is expected shortly from IBM.

## My Friend Flicker

Several digital-output manufacturers claim that their boards will have 640 by 400 resolution. The only way for them to do this is to run the boards in an interlaced mode, which means the image may flicker annoyingly. The problem is that with 640 horizontal and 400 vertical dots, you just



can't funnel enough information fast enough through the available video pipeline. Ideally, boards should put 60 images on the screen each second. But with so many dots to address, these straining digital boards have to alternate putting the odd numbered lines on the screen 30 times a second and then the even numbered lines 30 times a second.

The human eye can't detect an image flickering at 60 times per second, but can discern one flickering at 30. For large, solid objects, this flicker is not readily apparent. But thin lines actually do appear to quiver on the screen as the image alternates between the 30 odd-numbered lines and the 30 even-numbered lines each second. If the boards had analog outputs, or if the monitors had long-persistence phosphors to blur the image slightly, such flicker problems could be eliminated. However, such hardware could be incompatible with existing IBM graphics software. Well, you can't have everything.

Some of the new boards will operate with both a color and IBM monochrome screen, but there are problems with this arrangement. Both boards use the same graphics memory area of the PC for mono and color monitor graphics, and the same output plugs. It is possible to have the output designed for a color monitor flash out into a misconnected monochrome monitor, or vice versa, with unpredictable and potentially destructive results.

Future boards may come with videotape interfaces that would allow users to create complex animations. Some board manufacturers claim their new offerings will boast far more than 16 simultaneous colors, and one, Conographic Corporation, says it will offer a vector graphics package that can draw certain figures onscreen up to several hundred thousand times faster than IBM's board.

Both the IBM and the Plantronics board allow programming in Microsoft BASIC using the graphics commands and statements (PAINT, DRAW, LINE, PUT, GET, BLOAD, BSAVE, CIRCLE, PSET, POINT). However the Plantronics board will not work with the PAINT statement since the method Plantronics uses to preserve IBM compatibility is to switch back and forth between two color planes. To BASIC, each of these planes looks exactly like an IBM board. These "multiple video planes" allow four colors to be overlaid in various combinations to form 16.

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## Goodbye Old Paint

Microsoft BASIC has no provision for dealing with 16 simultaneous colors, and its PAINT statement has no way of knowing that bits from both color planes must be checked to fill in an outline. This forces Plantronics board users to write their own fill routine or simply not use PAINT. Also, with the Plantronics board, you must repeat each of the Microsoft BASIC graphics instructions twice, once for each plane. Microsoft will eventually have to adapt MS-BASIC to handle 16 colors in a graphics mode, but this may not happen until IBM releases its own board.

It will be difficult initially for manufacturers to find software that can handle existing—and relatively primitive—graphics operations, while allowing the enhanced imaging capabilities of the new hardware. The first manufacturer to offer a wealth of software-accessible features and wired-in graphics utilities, while providing an easy interface to higher-level languages, may just pull away from the competition.

Industry experts agree that this coming generation of higher-quality graphics boards, along with improved monitors needed to display the results, will launch a new role for the IBM PC as a sophisticated graphics workstation. A year or two down the road, PC users will probably be able to turn out fairly spectacular imagery for point-of-sale displays, videotext screens, computer-based product information programs, how-to-do-it interactive videodisc/computer packages—perhaps even magazine graphics, typesetting, and commercial-quality animation.

## Saw Blade Magic

One of the first graphics utility packages for a new generation board is Videogram, the initial product of a small New York software house called Softel. Videogram is a 16-color "graphics presentation software package" that works with the Plantronics board and sells for \$300. (Softel also sells both the \$475 Plantronics board plus Videogram package, for \$525.) Videogram offers such advanced features as paintbrush creation and storage, 6X zooming for fine painting, image moving and copying, and data interchangeability with programs written in BASIC.

Softel president Paul Fiondella previously worked for NYIT, one of the nation's foremost computer-animation centers,



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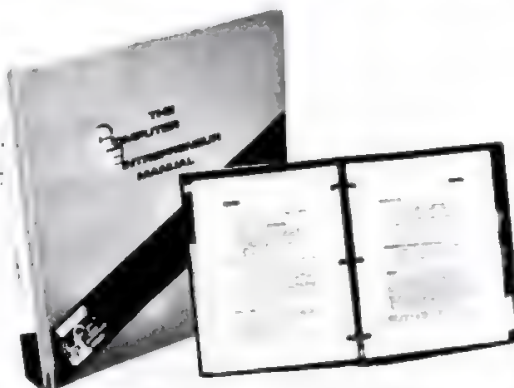
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where he was exposed to the work of such computer graphics pioneers as Alvy Ray Smith. Fiondella's goal was to produce a program that would transport many of the NYIT procedures to the IBM PC, and do as much of the "front end" drudge work for the PC user as possible.

Fiondella admits there is an illusion that the bigger the system the better the result—at NYIT he used a powerful VAX mini-computer—but he strongly denies this: "I've worked with artists who used nothing more than a sharpened saw blade and black film leader to create the most incredible graphics. It's more a question of ease of operation, the number of obstacles the computer places or doesn't place in the way of your ability to use the equipment." What most impressed him at NYIT was the possibility that some of the best features of their VAX system could be moved to a smaller machine. But, according to Fiondella, such large professional studios as NYIT have no interest in making computer graphics more available to the public.

Fiondella was also a member of the Filmmakers Cooperative in New York in the 1960s, where he worked with Ken Knowlton, a Bell Labs scientist who had developed an advanced graphics language called BeFlix. Fiondella feels there is a visible thread from Knowlton's work, through various paint programs, to Videogram, in the way they all handle textures adroitly. He points to his brushes—the actual devices with which users paint or draw their onscreen images—as a good example of an advanced feature that has successfully made the jump from a large system to a small one.

### A Watchmaker's Hands

Videogram is written in BASIC, and produces images that can be handled by BLOAD and BSAVE commands. The idea, according to Fiondella, was to "give BASIC programmers a powerful graphics utility for their own programs, and at the same time give businessmen a convenient way to make sophisticated charts and images without requiring any programming." He claims it shouldn't be necessary to write programs in assembler: "for many purposes Microsoft BASIC is plenty fast, and largely transportable to other computers."

However, he would prefer other graphics languages if they made better use of the



PC's resources. "BASIC is not really a very intelligent language, and it has a 64K memory barrier. And there are things about BASIC that are very difficult to deal with in large programs, such as the lack of local variables. A language such as C has many more facilities for writing more complicated programs."

Fiondella is proudest of the way his program will allow users to fine-paint small parts of the image pixel-by-pixel, and of his visual command system. Users often want to go back and touch up or erase parts of images they've created. The fine-paint command magnifies sections of the screen and blows up the size of the pixels so they can be isolated and their colors manipulated. Without it, users would need the hands of a watchmaker to change the image dot-by-dot.

His visual command system substitutes small pictorial representations of graphics commands for the commands themselves. Each of the PC function keys, plus the Tab and Escape keys, controls one command. Hit one of these keys and the appropriate graphics command icon appears onscreen. If you want to work with it, you simply press the Enter key. Otherwise you hit another command key to select an alternate operation.

Fiondella suggests that prospective microcomputer purchasers who need top-quality graphics "compare Videogram to the Apple graphics system, where you practically have to type in your address to get something to happen. God forbid you type in an Apple command incorrectly. With Videogram you can't type in something wrong because you never have to type in anything; instead every action is a one-key command."

You can create your own brushes or use the ones that come with the package. A brush is an arrangement of dots of the same color in a user-determined pattern within an 8 by 8 dot grid. With it, you can paint using any of 16 colors, something you can't do with any other program, according to Fiondella. The brush can be used in four different sizes and a vast selection of textures. And, the program makes it easy to save a previously-designed image, such as a company logo, and "paste" it onto a graphics screen.

While his program works only on the Plantronics board at present, he plans to make his program compatible with most of the new graphics boards. A version of

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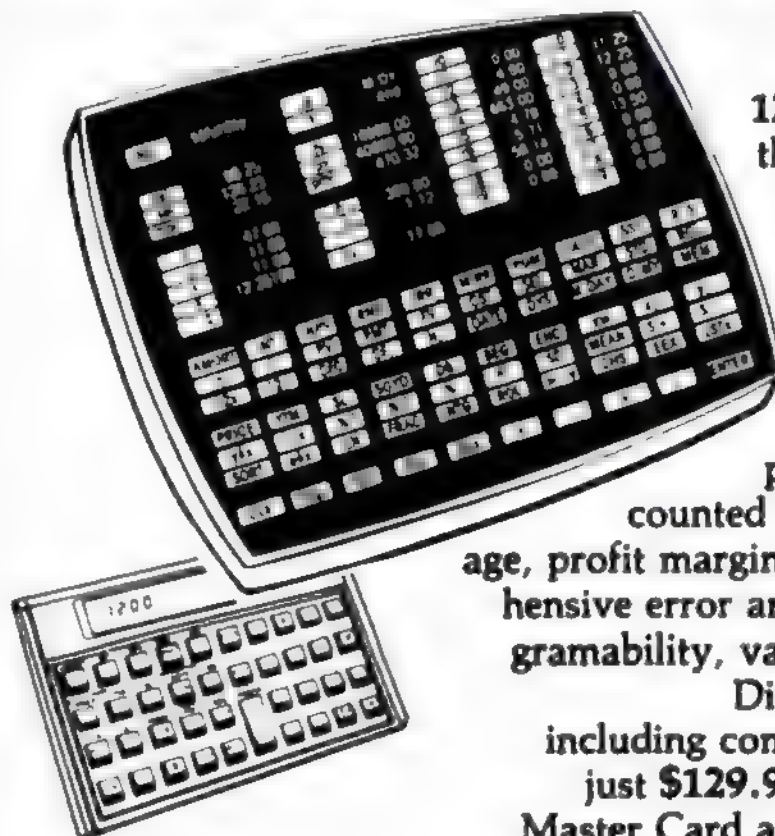
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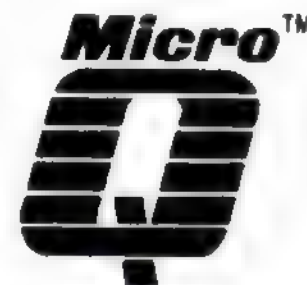
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Videogram is already being written to run on the Olivetti M-21, which has a resolution of 512 by 256. Fiondella expects to sell his program primarily to companies that will use it as a graphics utility in their offices. He also sees schools as a major market. But the future of graphics software, he feels, is in bundling it into integrated software packages along with databases, spreadsheets, and word processors.

## U SERS WILL need stored "vocabularies" of lines, textures and shapes.

"Graphics will play an essential part in the future of microcomputers," he asserts. "It will become very important in teletext operations and will be used to generate high-quality slides, to replace carousel and overhead projectors. Some users of the program will turn their PCs into video character generators. If a company can create just one good image that it can use in its advertising and marketing, the system will have paid for itself many times over. And once other companies see what pioneering users of such systems are doing, it won't take much persuading to get them to make this kind of software purchase."

### Zooming and Stroking

Videogram does make it easy to color individual pixels by zooming in on small sections of the screen. It uses the PC function keys adroitly, and saves much keystroking. And its ability to retrieve small saved images and insert them wherever wanted lets it process images the way text editors process words. Finally, its icons—the pictorial elements that represent graphics actions—are excellent. In any case there isn't much else on the market, besides Videogram, that can work with the new high-powered boards.

Since this program relies on BASIC's repertoire of graphics commands and statements, the production of images is not as fast as it could be. Even though the single-key commands dramatically reduce the amount of time it takes to put

images such as circles or squares onto the screen, complex pictures can still require laborious hours of painstaking detail work. This is because graphics are difficult to create from a keyboard. Artists don't type paintings—they use brushes, pens, and styli. The electronic equivalents of these painters' tools are digitizers like touch screens, bit pads, joysticks, trackballs, light pens, and mice. Fiondella is currently trying to add a mouse interface to his system, which should help make graphics creation far less irksome.

### From Toy to Tool

IBM's original PC graphics system was a toy. But the high-performance boards and monitors just now hitting the market, combined with newly available digitizing equipment, will turn a PC into a sophisticated graphics workstation that would have sold for \$100,000 or more several years back. There are even half a dozen expensive (\$2,500 and up) new cameras on the market that can make professional photographs of these enhanced images, as well as several interfaces that can produce animations on videotape.

What is needed now is software that will make it easy for users to create, manipulate, and store such images, then display them without excess grief. Videogram is a step in the right direction, but graphics software in general has a long way to go. Faster and more powerful image-producing and editing commands need to be written in low-level languages and attached to single-key English instructions. Users will need stored "vocabularies" of lines, textures and shapes that can be put on the screen by pointing to an area, specifying its size limits, and pushing a button. And systems will have to be packaged with friendly, menu-driven front ends that will let you doodle with a digitizer.

The state of microcomputer graphics is changing rapidly. Apple's Lisa already has some of the features mentioned above, though on a monochrome screen. The exotic electronics and special software languages of larger, dedicated graphics machines are hurriedly being translated for the PC. Will you be able to have such a sophisticated graphics workstation at your fingertips before next year? You can bet your bottom dollar the answer is yes. But until then, it just may cost your bottom dollar to buy one. /PC



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How many programs can make news just

by issuing a revision? Somehow I don't think you'll ever see the new *EatsMan* version 2.2 (now with user-selectable power-pill color!) or *Dental Records* 3.96M (silver fillings may now be distinguished from gold!) getting much ink.

But WordStar is indubitably and deservedly a classic. It's been a huge success on 8-bit computers, and MicroPro says it's sold 50,000 copies for the IBM PC alone. So when not one, but two updates come along, that's news.

Or is it? WordStar users may be pardoned a certain sense of *deja vu*. Before we tackle WordStar 3.24 (now yesterday's news) and the jazzy new version 3.3 (with speedy memory-mapped video, user-definable function keys, all-new manuals and installation procedures, and an update policy designed to give current users apoplexy), perhaps a little historical back-

ground is in order.

## Top of the Keys, Ma!

Hard as it may be for newcomers to believe, there was a time in the dim, dis-

**M**ANY PC owners bought *Baby Blue* cards mainly to run a CP/M version of WordStar.

tant past (about 365 long days ago) when the only word processing programs available for the PC were *EasyWriter* 1.0, the original version of *Volkswriter*, and what-



ever your friend down the block had slapped together from BASIC. The fact that many PC owners bought Baby Blue cards mainly to run a CP/M version of WordStar speaks volumes about the program's popularity and power.

Then came WordStar for IBM. It was called version 3.02M, and with hardly any competition on the market, the disks moved off the shelves faster than Charlie Chaplin's pies.

Its manual was a looseleaf nightmare and the tutorial thoughtfully let you enter page upon page of sample text instead of providing even one example on disk. The

IBM function keys seemed to have been assigned late one drunken Saturday night. The program supported only the IBM Parallel Printer, which couldn't do subscripting or superscripting. Block moves were severely limited on the 64K machines most of us used while waiting for the expansion-card situation to improve. But, we loved it.

Those of us who dutifully sent in our registration cards got a letter from MicroPro congratulating us on our sagacity. We also got a bunch of "keytop" stickers for our keyboards in case we weren't quite sagacious enough to memorize all of

WordStar's one-key Ctrl commands.

Now and then some of us tried to get help—interfacing a nonstandard printer,

## IN THE immortal words of MicroPro: "Ask your dealer."

reporting a bug, or whatever—by writing to MicroPro or calling at our own expense. This was rarely a pleasant experience. MicroPro held to its principles, number one of which seemed to be, "We will give the user absolutely no support." This philosophy was usually expressed by a simple three-word phrase: "Ask your dealer." Alas, few IBM dealers back then had any more experience with this WordStar than the users. It was around this time that one began to hear users mutter the most common of the non-obscene epithets used to describe MicroPro: "arrogant."

### Lots of Calls

PC-DOS 1.1 came out a few weeks later. WordStar 3.02 did not run from PC-DOS 1.1, MicroPro blamed this on Microsoft for changing some of its operating system's specs without advance warning. Whoever or whatever was to blame, the fact remained that those with double-sided drives had to limp along half-bakedly in PC-DOS 1.0 for months while MicroPro delved deep into the mysteries of the new disk operating system.

MicroPro undoubtedly referred a lot of callers to their dealers during this period. But when it released its PC-DOS 1.1-compatible WordStar 3.20, did MicroPro use its address lists to send us news of the update as quickly as it got us our keytops?

Nope. MicroPro also left that job to its dealers, few of whom had bothered to keep databases full of information on just who had bought just which version of WordStar. News of 3.20's existence filtered out to the world like gossip about certain film stars' arcane pharmaceutical habits—the difference being that WordStar never made the tabloids. After stumbling upon the news in a magazine, club newsletter, or bulletin board, disgruntled citizens across America muttered impre-

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cations, paid handling charges, returned their original 3.02 WordStar and MailMerge disks to their harried dealers, and waited an estimated "4 to 6 weeks" for version 3.20 to return.

### Larvae and Pupae

Version 3.20 retained some old bugs and offered some new ones of its own. Using WordStar's run command (R) while its menus were suppressed often created a dump of memory onto the screen—a graphics fireworks display that occasionally hung the system. The hyphenation feature sometimes left a useless message on the screen long after it had served its purpose. And if you accidentally inserted an illegal character (such as a /) in a filename, you got a "Disk Full" error that could do nasty things to your current file and bomb you back to PC-DOS. Love began to go sour.

The 3.20's installation program offered a new menu of printers, but only daisy-wheelers were added. They had to run serially, too; the IBM remained the only parallel printer with support. And SpellStar 1.20 crashed whenever it ran into certain words beginning with re.

But still, with the puzzling new documentation you could always patch the printer area for your machine, as long as you knew enough about DEBUG, hex characters, and control codes. "Disk Full" errors were definitely less of a problem for those using 320K drives. And the best yet: when you sent the WordStar 3.20 registration card back in the mail, you got another letter congratulating you on your wisdom—and another set of keytops! If you also happened to be a MailMerge registered user, you received two letters and two sets.

Users all over America stuck keytops to their foreheads in silent protest. A few intrepid souls may even have tried to get through to MicroPro to ask about how to run WordStar with their new "fully IBM-compatible" NEC Spinwriter 3550s. It was around this time that a collective mutter of "arrogant" was heard rumbling throughout the land.

### One More Time

A couple of months later, new rumors floated through the computer world as MicroPro ignored its registered users yet again. This time there was supposed to be a WordStar 3.24 that would fix "all known

bugs." As usual, you would need upgrades of Mailmerge and SpellStar to run with it. As usual, the upgrade was nominally "free," but many dealers (unless they were very understanding) exacted some sort of handling charge. As usual, you needed to send in your 3.20 disk and wait 4 to 6 weeks for the upgrade. And you would do all these things gladly, because of the clever inducement MicroPro had provided in the past: keytops!

Alas, I've never gotten my keytops for duly sending the registration cards in for 3.24. Maybe something was wrong with the mails. But I did get my new disks.

### 3.24—Standard of the Month

Version 3.24 will run from PC-DOS 1.1 or 2.0. It catches illegal filename characters. MicroPro supposedly has rectified the problem in SpellStar 1.24 (untested by me). The R (run) screen dump bug has also been fixed, though a message (visible only when the menus are not suppressed) warns that some programs may not let you back into WordStar when you're through with them—DISKCOPY being but one of

**S**PELLSTAR  
*1.20 crashed whenever it  
ran into certain words  
beginning with re.*

many. The message implies that this problem won't happen with PC-DOS 2.0, but MicroPro now admits that another last minute DOS-surprise from Microsoft has rendered that implication untrue.

The new version's documentation includes a tantalizing sheaf of material about the non-IBM MS-DOS and CPM-86 versions. Users with those editions apparently get a much better installation program. It lets them change the starting defaults for such things as margination, justification, hyphenation, and pagination—a whole damn nation of ill-chosen defaults that most of us PC users have to change every time we type those magic letters WS from PC-DOS.

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To run properly with WordStar 3.2 or 3.24 under PC-DOS 2.0, SpellStar 1.24 must be modified with the overlay file SPELSTAR.OVR. A corresponding patch must also be made to one WordStar file: WSOVLY1.OVR. This patch to WSOVLY1.OVR must also be made to WordStar versions 3.20 or 3.24 when running with SpellStar 3.3. The combination of SpellStar 3.3 and WordStar 3.3 already has the correct patches built in.

Use DEBUG to make the following changes (all numbers are in hexadecimal format).

#### WSOVLY1.OVR

Address	Old Contents	New Contents
3707	2e	1e
3714	90	30
3715	90	e4

#### SPELSTAR.OVR

Address	Old Contents	New Contents
100	58	e9
101	a2	9d
102	d6	00
103	02	90
1a0	20	8f
1a1	20	06
1a2	20	b0
1a3	20	01
1a4	20	8f
1a5	20	06
1a6	20	b2
1a7	20	01
1a8	20	58
1a9	20	a2
1aa	20	d6
1ab	20	02
1ac	20	e9
1ad	20	55
1ae	20	ff
6a7	8b	ff
6a8	e3	36
6a9	b1	b2
6aa	00	01
6ab	b2	ff
6ac	00	36
6ad	e8	b0
6ae	7e	01
6af	36	cb

Figure 1: Patches to run WordStar and SpellStar under PC-DOS 2.0.

PCers still get second-class treatment with a new version of the old installation program that deals only with printers. It adds precisely one printer to the limited menu: the NEC Spinwriter 3550. Many models of that printer require new PROMs to be installed before they'll work properly with WordStar. NEC will make the change for free, but there's no mention of this arrangement in the WordStar documentation. In the immortal words of MicroPro: "Ask your dealer."

Finally, there's a problem with the 1.24 version of SpellStar when it's run from PC-DOS 2.0. MicroPro has provided a fix, though. For details, see Figure 1.

### Modern Times, the Coming of 3.3

No sooner was 3.24 in the hands of harried users than rumors of a new WordStar flashed through the world. MicroPro briefly denied it, but the truth is out. Version 3.3 is with us at last—or should be by the time you read this.

What's new about 3.3? Quite a bit and not much. Screen handling has been greatly improved by using memory-mapping. The ten function keys are now programmable by the user. A new installation program lets you change quite a few of the WordStar defaults and handle a wide range of printers. Finally, and most important for new users, the manuals have been improved by orders of magnitude.

The new version will run on a 64K system from PC-DOS 1.1; with PC-DOS 2.0, which takes up more space, it will require more. Still more memory—the number appears to be 64K on top of whatever the operating system requires—is needed to take full advantage of all the new features, such as simultaneous printing and editing. The CP/M-86 version of 3.3, which I did not test, requires 80K.

### The WordStar Time Trials

Memory-mapping of screens is the most noticeable new feature. This technique, seen on PeachText and other late-model word processors, makes screen rewriting significantly faster. How much faster? I used a stopwatch to find out.

After you hit the PgUp or PgDn keys, the old version would make you wait about 2.5 seconds for the screen to rewrite. Version 3.3 reduces that time to about half a second—a fivefold speed increase.

Some functions register even more impressive gains. Scrolling one line

downward in the old version meant a wait of more than 2 seconds for a fully rewritten screen. In the new version, the same command worked so fast my stopwatch finger was really too slow to catch it; the result of 0.2 seconds probably reflected my rotten reaction time. Unlike the old

## *M*ICROPRO seems to have tamed the cursor.

version, 3.3 can keep up with continuous scrolling commands in either direction.

The difference can really add up in commands that do a lot of work onscreen. Using the "Ctrl-QQ Ctrl-B" paragraph reforming command to change the margins and line spacing of a 32,000-character test document took a little over 6 minutes with the old version—and about half that time with the new.

An extensive backward search-and-replace in a 16,000-character document took nearly 2 minutes in the old version and about 1 minute in the new. But the speed difference between the two versions could be minimized by hitting one of the arrow keys after ordering the search and replace; that prevents screen rewrites during the process. This technique sliced the old version's running time to just six seconds; the new version beat that time by only one second—the only difference being the time it took to rewrite the screen at the very end. My conclusion (supported by MicroPro): the internal operations of WordStar have not changed at all.

It's a slightly different aesthetic. Old WordStar seemed to "paint" the screen. Version 3.3 seems to "jump" into action. It can be slightly disconcerting, especially when you insert text above a page break indicator, which sometimes seems to bounce on the screen. I can accept this new quirk: after using the version 3.3 for a week or so, I find waiting around for the lethargic old version's screen rewrites as tedious as watching fleas grow hair.

Another nice thing about WordStar 3.3 is that MicroPro seems to have tamed the cursor. In earlier versions, the cursor often jumped ahead to the end of a word or line and back to the proper position when you



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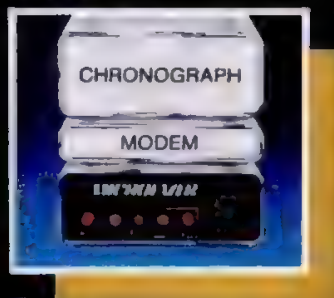


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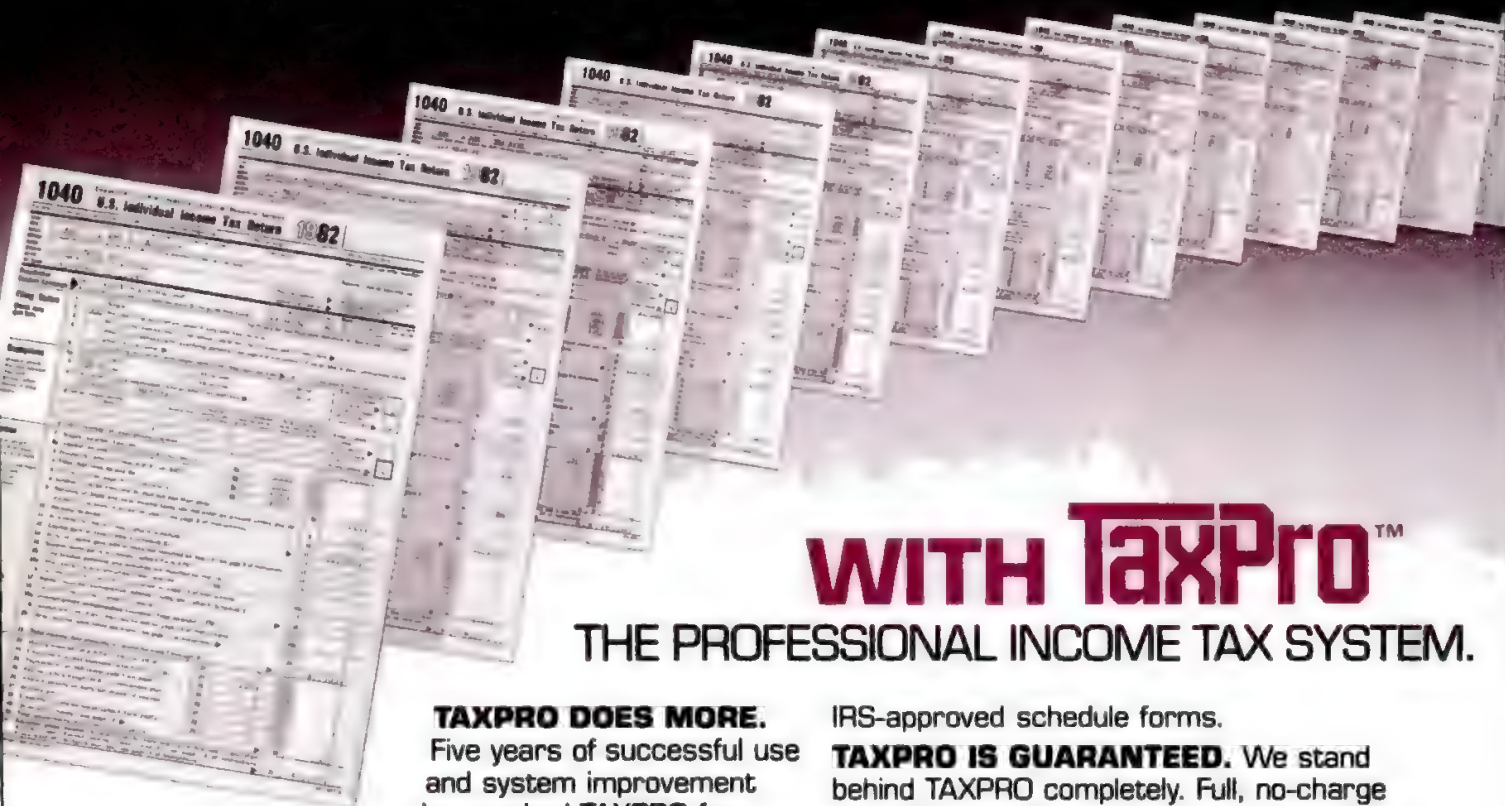


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inserted text. It doesn't do that anymore.

### Plus Ça Change . . .

But virtually nothing else has changed about WordStar. No internal operations have been revised, so in many respects version 3.3 is still not destined to be a speed demon. Much of the WordStar program is not resident in main memory. It's on overlay files that stay on disk, where they're called up as needed. Since these files are needed quite often, this system can slow things down significantly. By putting those overlays on a disk emulator in RAM, disk accesses become significantly faster, and unnoticeable visually or aurally. If I hadn't been able to do that, I'd probably have switched from WordStar long ago.

Another problem with WordStar is that it never addresses more than 64K of RAM—grand total, program and data—no matter how much memory you have in your machine. In practice, this means that no more than about ten pages of your document can be in RAM at one time. Larger documents are handled by swapping por-

tions back and forth from disk.

This slows things down, too. With WordStar, files are loaded into memory a hunk at a time until the workspace is full.

A Initial help level  
B Decimal point character  
C Non-document mode  
D Initial directory display  
E Initial insertion toggle  
F Justification toggle  
G Hyphen help toggle  
H Omit-page-numbering toggle  
I Top page margin  
J Bottom page margin  
K Left margin  
L Right margin  
M Number of lines per page  
N Page offset  
O Form feeds  
P Data field separator  
Q Variable name symbol  
R System disk drive  
S Function keys

Figure 2: Lettercodes for modifiable WordStar defaults.

As you move forward through an existing document, hitting PgDn can produce a short delay while WordStar goes out to get

the next hunk. Once the file is fully loaded into memory, moving from page to page or even from front to back takes about a second. But if the document is too big to fit in the RAM, the same command can take ten seconds or more. And because WordStar creates special files for backward moves in long documents, such moves take even longer. Given all the memory available in many user's PCs, this is a shame.

MicroPro tells me ninety-odd percent of all documents created with WordStar are three pages or shorter, which is its excuse for not expanding available memory. Still, since WordStar is one of the most transparent editors available for handling long documents (in fact, there is no official maximum document size) this strikes me as a copout for wasting potential. By adding even 64K to the workspace, MicroPro could solve the problem for all but the very longest chunks of text. But, this hasn't happened.

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The all-new installation procedure should save many headaches—and create

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a few more. The good part is that you can change a wide range of defaults to suit your needs (see Figure 2). Now you can dash off a quick letter without having to remember to type an .op command to avoid getting a neatly centered page number—that's enough to make the long suffering WordStar user's eyes fill with tears of joy. Being able to bring up the program with automatic justification and hyphenation turned off truly maketh the cup run over. But changes to the default values for such things as top margin, bottom margin, and page offset are not reflected in the online Help screens available from the J menu. Better write your new defaults down to avoid later puzzlement.

### Funk and Function

MicroPro has a philosophy about function keys. The company contends that control characters are easier to use because you don't have to move your fingers from the keyboard's home position.

Now I don't entirely disagree. When entering text, I find myself using the control key versions of the simpler commands

more often than not. Though MicroPro has taken a lot of guff for making them non-mnemonic, I like them that way. All the basic cursor-movement commands are po-

**W**ITH ONLY TEN  
keys to play with,  
you're going to assign  
them to functions you'll  
use frequently.

sitioned on the keyboard to be reached by the left hand. Once you're used to them, your muscular memory will guide you to the correct keys. The method of moving the fingers left or right to move the cursor correspondingly may not provide you with mnemonic initials (A for Left, F for Right?), but it's logical and fast.

When you're editing text, function keys make a lot more sense. You're often

doing fancy footwork with block moves and the like, and you want those editing commands ready to go at a single touch. Ever since the first IBM version of WordStar, MicroPro has implemented the PC's ten function keys—but only in their unshifted modes. In version 3.3, they've retained the same functions as before—except for relocating the “go to beginning” and “end of file” commands. Contrary to all sense, the beginning of file command had been on F10, and the end-of-file command on F9. In the new version, sensibly, they're swapped.

In case you prefer the old way, you can switch back. The new installation program lets you decide what the ten unshifted function keys will do. Each key may be assigned a maximum of six characters.

### Liberating Line 25!

You can also put a custom six-character-description of each function key you set up on the bottom line of the screen; this will appear in a format similar to the one IBM's BASIC uses. As far as I'm concerned, that's an utter waste of precious

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screen space. Since the PC's function keys don't run beneath the screen across the top of the keyboard, their position isn't consistent with the labels on the screen. Besides, with only ten keys to play with, you're going to assign them to functions you'll use frequently. The minute you memorize them, you're going to want to turn off the damned labels that keep staring back at you just two lines below where you're usually entering your text, stealing a precious line of your screen.

But you can't shut them off! Considering that WordStar has toggles for everything else but the status line—you can take off page breaks, control characters, the ruler line—this is a real stupidity. Fortunately, I've prevailed upon MicroPro to let us in on the secret of freeing line 25 from the labels. See Figure 3 for details.

### Apple Polishing

MicroPro's philosophy—or something—keeps it from doing anything sensible about the PC's 30 shifted function keys or the control-shifted versions of its numeric keypad. Other programs (including my ProKey-enhanced version of WordStar) logically make Ctrl-left-arrow and Ctrl-right-arrow move the cursor left or right a word at a time. But not WordStar. This is all the more annoying when you consider that MicroPro has implemented that sort of arrangement on versions for the Apple IIe and III. It even assigned 20 additional functions to the "Open Apple" and "Closed Apple" keys used in conjunction with the ten numerals. Didn't IBM

1. Make a spare copy of your disk with the WS.COM file (just in case).
2. Place a PC-DOS disk with the DEBUG.COM file in drive A.
3. Place the disk with the WS.COM file in drive B.
4. At the A> prompt, type and enter debug b:ws.com.
5. A hyphen will be displayed. That's the DEBUG prompt. Type and enter e 0248.
6. Be sure "18" is displayed. Then Type and enter 19.
7. Type and enter e 5041.
8. Be sure "8d" is displayed. Type and enter c3.
9. Type and enter w.
10. You will get a message about the material being written to disk. At the hyphen prompt, type and enter q to exit to PC-DOS.
11. The patch has been made. If at any point above, you fail to see what has been specified, do not attempt to make the patch by typing w. Instead, at the hyphen prompt, simply type q. This will allow you to exit to PC-DOS without saving your changes to disk.

Figure 3: Instructions for making a patch to get rid of the function key display in WordStar 3.3.

users deserve as much?

Aside from the function keys, no key assignments are easily changeable from MicroPro's choice of defaults. The dele-

tion key still behaves like a destructive backspace, deleting the character to the left of the cursor instead of the one above it. Considering that Ctrl-Backspace does the same thing in the same way, this has always been nonsensically redundant. We've got a fix for it in Figure 4.

But let's face it: WordStar 3.3 is not going to take many sales away from the inventors of ProKey and similar keyboard enhancers. WordStar's ten function keys just aren't enough to go around, and each key's six-character limit means you can barely use one to set a margin. Serious WordStar users and authors with special formatting needs (screenwriters come immediately to mind) will find that a keyboard enhancer is an absolute must to keep WordStar from producing nothing but frustration.

### Install or Stall?

Micropro claims its new install program is user-friendly, but the manufacturer has a definition of friendliness that's different from mine. To use its program to reassign the function keys and onscreen labels, you have to loop through forty prompts and responses. Apparently memory-mapping wasn't used in the installation program: some of the repeating prompt screens take as long as twenty seconds to write. In addition, some of the instructions are less than clear. Fortunately, you won't have to use the program often—you wouldn't want to.

You also use this program to install WordStar for the type of printer you have.

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This is easy enough if your printer is one of the ones the program supports. (These are listed in Figure 5.) If not—and some prominent models are omitted—you have to go through a long session of setting control codes. This task must be done in hexadecimal format. Unless you are reasonably expert, you may reasonably expect to become confused.

The installation manual, unfortunately,

1. Follow steps 1 through 4 in Figure 3.

2. A hyphen will be displayed. That's the DEBUG prompt. Type and enter e 71C.

3. Be sure "7F" is displayed. Then type and enter 07.

4. Follow steps 9 through 11 in Figure 3.

Figure 4: Instructions for making a patch to make the Del key delete the character above the cursor. This method works with WordStar 3.20, 3.24 or 3.3.

ly, only adds to the confusion. It offers page upon page of incomprehensible material on protocols and printer drivers without ever mentioning that none of that information is the least bit relevant to installing printers that run from a parallel port. Although its documentation doesn't mention this, MicroPro recommended that a printer running from the IBM be configured with no protocol and treated as an "operating system primary list device." If this is done for a serial printer, two PC-DOS commands will be required:

MODE COM1: 9600,N,8,1,P

MODE LPT1: =COM1

**I**F YOU'RE AN old WordStar hand, you'll probably find it speedier to use DEBUG to make all your patches at once.

These commands assume that the printer will be running at 9600 baud and that a cable lets the printer and the PC exchange status information.

If you're an old WordStar hand, you'll probably find it speedier to use DEBUG to make all your patches at once rather than endure a seemingly endless and occasionally ambiguous series of prompts. All the patch points documented in Appendix C of the WordStar 3.20 and 3.24 manuals remain the same in version 3.3. A new patch area is included for the NEC 3550's "VMI Trailer String"; it begins at 0881h, so addresses above that will not match the old version.

Specific documentation on those points will no longer be supplied to users of WordStar 3.3. MicroPro has decided to

limit access to those documents to distributors and dealers. If you're contemplating an upgrade, save your old manuals. Although the new installation program can be used to patch many areas, some (like the underscore character, needed by the Okidata 92 and other printers) are accessible only through DEBUG.

A special installation program for PC's operating in color was not available at press time. This program will allow a user to try out various combinations of foreground and background colors—one for text, and one for menus and highlighting—before selecting the most suitable

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one. Once again, this program makes no changes in previously available features; it simply makes some already existing features more accessible to users without technical expertise.

A few minor changes have been made in the program itself. The traditional WordStar menus have been cleaned up a little. The Opening Menu is now called by that name rather than "No-File Menu." When working with it, you now get the message "not editing" on the status line instead of "editing nofile."

The layout of toggles has changed, too. The oxymoronic message "justification on (OFF)" is now simply "justification now OFF." Heretofore, the menu has falsely claimed that typing Ctrl-Q-Del would delete the line to the left of the cursor; now it really does. (Typing Ctrl-Q-Ctrl-Back-space always has accomplished the same thing and it still does.) All of these clarifications should make things less confusing for new users.

#### Manual Dexterity

New users should also fare significant-

ly better with MicroPro's entirely rewritten manuals. Presented in slightly-bigger than IBM-size ring binders and typeset with excellent graphics, they are the best thing in the new package.

The WordStar manual is one of the best I've seen. Organized by menus and functions, it's clear, readable, and informative. To eliminate possible points of confusion, it offers simple, pithy examples and illustrations. It also provides a wealth of handy tips that many seasoned users had gone months before discovering. I even learned a few things myself.

About all I missed from the old manual were the classic essay on "Where the Cursor Won't Go," explanations of certain useful technical items (the current manual seems to take great pains to avoid these points), and the more detailed explanation and hortatory material about the necessity of saving text to disk.

The MailMerge manual is vastly improved, too. The old one was a marvel of incomprehensibility. The new one, with its copious examples and clean graphics, helps make a complicated process under-

These printers may be installed in either serial or parallel mode if applicable. Other printers may be installed with a "custom printer installation" option.

- A C. Itoh/TEC Starwriter F-10
- B Centronics 353
- C Centronics 739
- D Diablo 630
- E Diablo/Xerox 1610/1620
- F Diablo/Xerox 1640/1650
- G Epson MX80/100-no Grafrax
- H Half line feed printer
- I IBM Parallel Printer
- J MPI 88G/99G
- K NEC 8023A Matrix Printer
- L NEC Spinwriter 3550
- M NEC Spinwriter specialty
- N Okidata ML84A
- O Olympia ESW-102
- P Qume Sprint 5-9/45-11+
- Q TI 810/820
- R Backspacing standard
- S Standard printer

Figure 5: Letter codes for standard printer types supported by the WordStar installation program.



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standable. There are, however, some omissions: the explanation of how to use a command file to link multiple files (for example, chapters of a novel) at print-time was more comprehensive in the old manual. Neither is informative enough about all the useful things that can be done with the best-kept secret in the WordStar world: MailMerge's powerful "print-time line former." This lets you change such things as margination and line spacing at print time without making any changes in your document.

The new manuals are ruthlessly honest. They even point out some of WordStar's limitations—like the find command's frustrating inability to catch multiple-word strings when they break across lines—and give suggestions about what to do about them. (In this example, not much can be done, I'm afraid.) The manuals are so honest, in fact, that they point out problems that don't exist. According to the manual, trying to change the logged disk drive to one that doesn't exist will force you to reboot the system. When I tried it, the worst that happened was that WordStar just ignored the command. Certain warnings about file length don't seem terribly relevant to the IBM world.

This points up the biggest problem with the documentation. The only information specifically for the IBM PC appears in a section ingenuously named "Addendum of Special Considerations: WordStar for IBM PC, Apple, and Other 16-bit Computers." (In case you're wondering, it doesn't really apply to the Lisa.)

***T***HE MANUALS  
are so honest, in fact,  
that they point out  
problems that don't  
exist.

This is the only place users can read that the PC's arrow keys do work and that the function keys may be designated by the user. This section could well be overlooked.

The folks at MicroPro still don't understand points about the PC. They seem to

believe that the numeric keypad will function as a cursor pad when the NUM LOCK shift is ON. The rest of the world does not agree.

MicroPro has chosen, unfortunately, to retain its truly awful WordStar Training Guide. In the palmy days of 8-bit CP/M, when nothing else was around, some people called this now-ancient document state-of-the-art. Today it can only be termed dismal.

The training guide forces you to type long documents—and type them with errors intact! This goes contrary to habit; the required errors in the text aren't even highlighted in any way. If you manage to repress your instinct for rectitude, you'll get to cleaning up your text later on. But if you've typed the "errors" erroneously, you'll run into problems.

If the sample texts were offered on disk (as with just about every other program these days) and the lessons were more carefully thought out, the WordStar Training Guide might be worthwhile. I remember trying to learn WordStar from it in my novice days and giving up in disgust. My

solution was to read through the manual and key in summaries of its various sections. That method or studying one of the many non-MicroPro WordStar books, cassettes, or disks still seems better than confronting the training guide. Its CP/M-oriented treatment of machine-specific items can cause massive confusion.

### Room for Improvement

WordStar 3.3 is a definite improvement, but it does retain some old frustrations. It's now almost impossible to out-type the screen, but you still have to reform paragraphs yourself if you don't want to find text hanging around in bad places. Using Ctrl-B to reform longish paragraphs still tends to stick the cursor at the center of the screen, forcing you to scroll upward to see your starting point.

Despite the added speed, lots of things are still slow. Saving long documents can seem to take forever (to be precise, 20 to 40 or more seconds). The length of your wait depends on where the cursor is at the time of the save: the closer it is to the end, the faster.

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It's still annoying to work in the "outer space" area reached by horizontal scrolling. Even with memory-mapping, after correcting a line of text sticking out to the right, you might have an annoying wait before the rest of the text comes back again; sometimes you only get halfway back to where you want to be. Holding down a left or right arrow key when the cursor is out past column 80 can give bizarre results. The cursor seems to bump against the edge of the screen when it's actually moved a long way: how far is revealed only when you lift your finger from the key.

The most irritating glitch occurs when you're paging through long files. Sometimes when you hit the PgDn key, WordStar skips a few pages—jumping, for example, from page 5 to page 12. This seems to happen only rarely, and no text is actually lost, but it's terribly unsettling. The problem has been around since version 3.02; while I was editing this article, it cropped up again.

By now, WordStar ought to be smart enough to show underlining and boldfac-

ing onscreen instead of displaying embedded control characters. It still isn't. And surely its "Fatal Error" message, a scarifying holdover from the olden times of computerdom, could be rewritten. The manual softens this blow not at all by cheerfully calling the message "a colorful way of saying that you're going to lose the work done in your current editing session."

MailMerge doesn't seem to have been upgraded at all this time around. A new "conditional print" feature (allowing, for example, mailing to selected zip codes) was added, but only to 8-bit versions, not the one for the PC. This is another example of how MicroPro treats PC users as second-class citizens. But, even if you already possess MailMerge, you'll need a 3.3 version of this program to run with the new WordStar.

The same holds true for SpellStar. It still has a small dictionary (20,000 words), it's still slow, and it still lacks features, like dictionary lookup, now standard in similar programs. Its major advantage is the convenience of being able to run it from within WordStar. But because it has

to run with WordStar, working on a system with single-sided drives can be difficult. Although the new documentation claimed that SpellStar will work from either drive A or the logged disk drive, the version sent to me worked properly only from drive A.

### Now Comes the Bite

If you are currently a WordStar registered user, please sit down a moment. Take a deep breath.

Ready? MicroPro wants \$85 each for the 3.3 versions of WordStar, MailMerge, and SpellStar. We are talking about a total of \$255 here. Is that clear?

Was that the word "arrogant" you just screamed? Or was it something worse? Remember, with the new versions of SpellStar and MailMerge, we are talking about two programs that are substantially unchanged. The only reason you need them is that their old versions won't run with the new version of WordStar. Aside from the improved manual, WordStar itself has only one major modification.

Besides, although it will run from PC-

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DOS 2.0, the new WordStar isn't really designed for it. Running MicroPro's programs with the PC-DOS R command can still hang up the system. When run from hard disk, WordStar won't find its overlays or files in subdirectories, forcing you to clutter up the disk with multiple copies

## STARINDEX

*will generate indexes, tables of contents, and lists of figures and tables.*

of the overlays. Clearly MicroPro will have to address this problem sometime: we can undoubtedly look for yet another version of WordStar down the road.

For your \$85 you will get, as MicroPro is quick to point out, all the new documentation and binders along with the disks. But, if you've already mastered the programs, surely you can get along without expensive new manuals. And if you're thinking that your dealer will give you a discount on the update, think again. This update will be handled directly through MicroPro. Somehow I think this \$85 figure, unlike the firm's other wildly inflated and widely discounted list prices, is graven in stone.

If this is the case, I expect "unauthorized copies" will be produced on a massive scale since WordStar, to MicroPro's continued credit, is still not copy-protected. If you get your update from a pirate, though, MicroPro needn't deign to deal with you next time there's an update. Maybe the manufacturer planned it that way all along.

MicroPro is trying to turn its software family into an integrated environment. A forthcoming product, called StarBurst, will serve as a "shell" of menus that will let you run various "Star" family programs, and possibly others, without ever having to look at a PC-DOS prompt.

More enhancements for WordStar will be available, too. A program called StarIndex should be available for the IBM PC in July. Only the manual was available to me at press time, but it reveals that StarIndex will generate indexes, tables of contents,

and lists of figures and tables by picking out dot commands embedded in the proper pages in the text. It definitely will not do footnotes. Cost: \$195, but it's included free if you buy WordStar, MailMerge, and SpellStar 3.3 as a package.

That's dandy, but, given MicroPro's attitude toward its customers, I'm certainly in no hurry to add another of its products to my shelf—especially if it may represent another \$85 when the next "major" WordStar update comes along. I suspect a lot of WordStar users will agree.

MicroPro is keeping the 3.24 versions of SpellStar and MailMerge on the market as a "service" to those WordStar 3.20 users who aren't in the mood to spring for the big enchiladas. Certainly anyone with earlier versions should demand the 3.24 upgrade pronto—before it's too late.

### The Quality that Remains

WordStar still has a lot going for it. I've put at least a thousand pages of text through it in the past year with few problems. Using a disk emulator and keyboard

enhancer has improved its convenience significantly. I'm still attracted to its "What you see is (pretty much) what you get" approach, and its screens are still among the cleanest around. I do a lot of block moves; despite the Ctrl-B nuisance, WordStar handles these in a way more to my liking than any other program I've seen. Its nondocument mode (N) is probably all I'll ever need in a program editor.

I admit it. Even in spite of Ctrl-B and its stupid approach to double-spaced text, WordStar has become a trustworthy friend. But I would drop it like a bad habit if someone came up with a similar screen-oriented program that did a few things WordStar can't. I'd be won over by instant reformatting and manipulating text from two files at once, generating footnotes and indexes simply and easily, and producing standard ASCII files without special characters that can drive a typesetter crazy.

See, I really do like WordStar. I just can't stand its parents. They always seem to treat me and my friends like the new kids on the block. /PC

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CIRCLE 114 ON READER SERVICE CARD

PC MAGAZINE 410 JUNE 1983



*Using the DEBUG program of PC-DOS you can recover lost WordStar files even after doomsaying fatal error messages appear.*

# A Fast Recovery From WordStar Disaster

You know you are good at it. You have been at it for months. Even passing strangers remark on your adeptness on the machine. All of the function key meanings are memorized. You dream in menu format and dot commands are child's play. You are a WordStar star.

But imagine a scene like this: You have two hours to present a clean report to your new boss, who isn't thrilled with technology to begin with. He only gave in on the PC purchase to let you hang yourself. Now the time for reckoning is at hand.

You have the report in your head. The outline is clear and the words are coming. WordStar is loaded. Sentences flow effortlessly from your fingertips and appear on the screen. Fifteen minutes left and you're paging through the text with those nifty cursor control keys. The paper is ready! SAVE and PRINT. You see

**\*\*DISK FULL\*\***  
>A

You struggle to remain civilized in an

uncivilized situation.

## Postmortem Programming

Now there are several conditions under which WordStar will give fatal error messages and return you to PC-DOS. The most common are saving to a write-protected data disk or to a disk that is full, read/write errors, and instituting a backwards search on a long document file. For most of these conditions, the WordStar manual provides instructions that will normally recover your data unless you have reloaded WordStar, turned the PC off, or have for any reason failed to follow the instructions to the letter.

Though WordStar automatically returns to PC-DOS under such conditions, the lost document file can usually be recovered in its entirety even though the WordStar session terminated abnormally before the revised document was saved to disk. The file's data will still be available in the PC's random access memory if no other action has taken place to erase or



04A5:B520	00 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00	.....
04A5:B530	00 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00	.....
04A5:B540	00 00 00 00 00 00 00 00 00-0D 0A 0D 0A 0D 0A A0 A0	.....
04A5:B550	A0 A0 20 20 20 20 20 20 20-02 41 20 54 57 4F 2D 4D	.A TWO-M
04A5:B560	49 4E 55 54 45 20 52 45-43 4F 56 45 52 59 20 46	INUTE RECOVERY F
04A5:B570	52 4F 4D 20 57 4F 52 44-53 54 41 52 20 44 49 53	ROM WORDSTAR DIS
04A5:B580	41 53 54 45 52 02 0D 0A-0D 0A A0 A0 A0 A0 20 20	ASTER.....
04A5:B590	20 59 6F 75 20 6B 6E 6F-F7 A0 20 79 6F F5 20 61	You know you a
04A5:B5A0	72 E5 20 67 6F 6F E4 20-61 F4 20 69 74 AE A0 59	re good at it. Y
04A5:B5B0	6F F5 20 68 61 76 E5 20-62 65 65 EE 20 61 F4 20	ou have been at
04A5:B5C0	69 F4 A0 66 6F F2 20 8D-0A 8D 0A A0 A0 A0 A0 6D	it for .... m
04A5:B5D0	6F 6E 74 68 73 AE A0 20-45 76 65 EE 20 73 74 72	onths. Even str
04A5:B5E0	61 6E 67 65 72 F3 20 70-61 73 73 69 6E 67 20 62	angers passing b
04A5:B5F0	79 20 72 65 6D 61 72 EB-20 61 F4 20 79 6F 75 F2	y remark at your
04A5:B600	0D 0A 0D 0A A0 A0 A0 A0-61 64 65 70 74 6E 65 73	.... adeptnes
04A5:B610	F3 A0 20 6F EE A0 20 54-4B C5 A0 20 4D 41 43 4B	s on THE MACH
04A5:B620	49 4E 45 AE A0 20 41 6C-EC 20 6F E6 A0 20 74 68	INE. All of th
04A5:B630	E5 A0 20 66 75 6E 63 74-69 6F EE A0 20 6B 65 F9	e function key
04A5:B640	20 BD 0A BD 0A A0 A0 A0-A0 6D 65 61 6E 69 6E 67	.... meaning
04A5:B650	73 20 61 72 E5 20 6D 65-6D 6F 72 69 7A 65 64 AE	s are memorized.
04A5:B660	20 59 6F F5 20 64 72 65-61 ED 20 69 EE 20 6D 65	You dream in me
04A5:B670	6E F5 20 66 6F 72 6D 61-F4 20 61 6E E4 20 64 6F	nu format and do
04A5:B680	F4 20 8D 0A BD 0A A0 A0-A0 A0 63 6F 6D 6D 61 6E	t .... comman
04A5:B690	64 73 20 61 72 65	

Figure 1: While in PC-DOS, this DEBUG screen shows the beginning of the "lost" WordStar file, recovered from the PC's RAM. This file begins at location 8559.

overlay memory in the interim.

The recovery procedure utilizes the DEBUG program that comes with your PC-DOS disk. DEBUG is used to locate the text of your document in memory, name a file on disk on which to write, calculate the size of your document, and finally write the section of RAM where the text resides to your disk. When your data is on disk, loading a file within WordStar is business as usual.

### Resurrecting a File

The steps in the procedure are easy.

- The first thing to remember is to leave the PC turned on!
- Insert the PC-DOS disk in drive A.
- When you see the A> prompt, type DEBUG. You will get a new prompt character, a dash.
- Type D 04A5:7000 FFF0.
- The screen will then display the contents of memory between the locations specified in the above D command. In a 128K machine, the first address that WordStar uses to store text is usually above 04A5:7000 in WordStar 3.24 and above 04A5:8000 for older versions. (See Figure 1.)

- You will see the beginning of your text on the right side of the screen. Hit Ctrl-Num Lock to stop the scrolling when your data appears. Write down the beginning address, then hit any key to look for the end of your document.

- As the text is displayed on the screen, watch for the end of character data and the beginning of a series of symbols that are not alphanumeric. Hit Ctrl-Break

***IF YOU ARE  
adverse to hex  
arithmetic, DEBUG will  
calculate the length of  
your document.***

to stop the scrolling and you will see the dash prompt (-) again.

- On paper, mark down the address of the line following your text.
- If you are adverse to hex arithmetic, DEBUG will calculate the length of your

document if you type H (address 1) (address 2). The second number that DEBUG returns will be the result of address 1 minus address 2.

- Name the file on disk that you will write to by typing N (filespec), then press Return. Precede the name with B; if you are writing to the B drive.

- Set the PC registers BX and CX (responsible for controlling the number of records to be written) by typing R, then Return BX (length of text in hex), then Return. CX (same as BX value), then Return.

- Write the file by typing W (beginning address), then Return.

Now you will hear the file being written to a disk, which will be music to your ears. When this is finished type Q (for Quit), then Return. Load WordStar and get the new file with the D command. You may have to clean up the document a bit if the length you specified was not its exact size; however, you will find that the entire text has been recovered.

See Figure 2 for a screen showing the execution of this recovery procedure. You may have to modify this slightly for a single-drive system. A note of caution: Word-



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Star begins to overlay memory when 10 pages of text are paged down or entered. You may not get all of your data, but you will get most of a large file. Figure 3 is proof that there is life after fatal errors.

#### Further Recovery

Of course, a recovery from WordStar is only the beginning of the many magical things you can do with DEBUG. After an abnormal ending from many commercial programs and utilities or custom-written programs, lost data can be recovered by

invoking this tool.

Typically, database managers, spreadsheets, and word processors work under the same general rules, that is, they capitalize on the amount of RAM available and keep as much data as possible before overlaying memory. So let your imagination wander and DEBUG recover. /PC

Randy Bennett is a researcher and Roger Kershaw is a systems manager for the Educational Testing Service in Princeton, New Jersey.

```
04A5:9B30 72 67 65 20 66 69 6C 65-2E 20 20 20 20 20 20 0D rge file.
04A5:9B40 0A 0D 0A 0D 0A 0D 0A 47-6F 6F 64 20 4C 75 63 6B .....Good Luck
04A5:9B50 21 0D 0A 0D 0A 1A 1A 1A-1A 1A 1A 1A 1A 1A 1A 1A !.....
04A5:9B60 1A 1A 1A 1A 1A 1A 1A 1A-1A 1A 1A 1A 1A 1A 1A 1A .....
04A5:9B70 1A 1A 1A 1A 1A 1A 1A 1A-1A 1A 1A 1A 1A 1A 1A 1A .....
04A5:9B80 1A 1A 1A 1A 1A 1A 1A 1A-1A 1A 1A 1A 1A 1A 1A 1A .....
04A5:9B90 1A 1A 1A 1A 1A 1A 1A 1A-1A 1A 1A 1A 1A 1A 1A 1A .....
04A5:9BA0 1A 1A 1A 1A 1A 1A 1A 1A-1A 1A 1A 1A 1A 1A 1A 1A .....
04A5:9BB0 1A 1A 1A 1A 1A 1A 1A 1A-1A 1A 1A 1A 1A 1A 1A 1A .....
04A5:9BC0 1A 1A 1A 1A 1A 1A 1A 1A-00 00 00 00 00 00 00 00 .....
```

```
-H 9B60 8559
20B9 1607
-N A:RESTORE
-R BX
BX 0000
:1607
-R CX
CX 0000
:1607
-W 04A5:8559
Writing 1607 bytes
-Q

A>WS
```

- The file ends at location 7B54.
- The H command in DEBUG mode uses hex arithmetic to calculate the size of the document.
- N names the file to which you will write the data.
- R initializes the BX register to the size of the document.
- The second R initializes the CX register to the size of the document.
- W followed by the beginning address writes the document to disk.
- The computer responds by telling you it has written the document.
- Q exits from DEBUG mode.
- The A> prompt returns you to PC-DOS, where you can load WordStar and be ready to edit the recovered document with the D command.

Figure 2: A screen showing the end of the "lost" WordStar file recovered from RAM, followed by the prompts and commands used to write this file to a disk.



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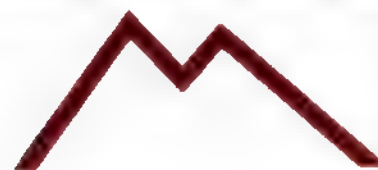
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- |   |                                   |
|---|-----------------------------------|
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- |                                   |                                     |
|-----------------------------------|-------------------------------------|
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- |                              |                                   |
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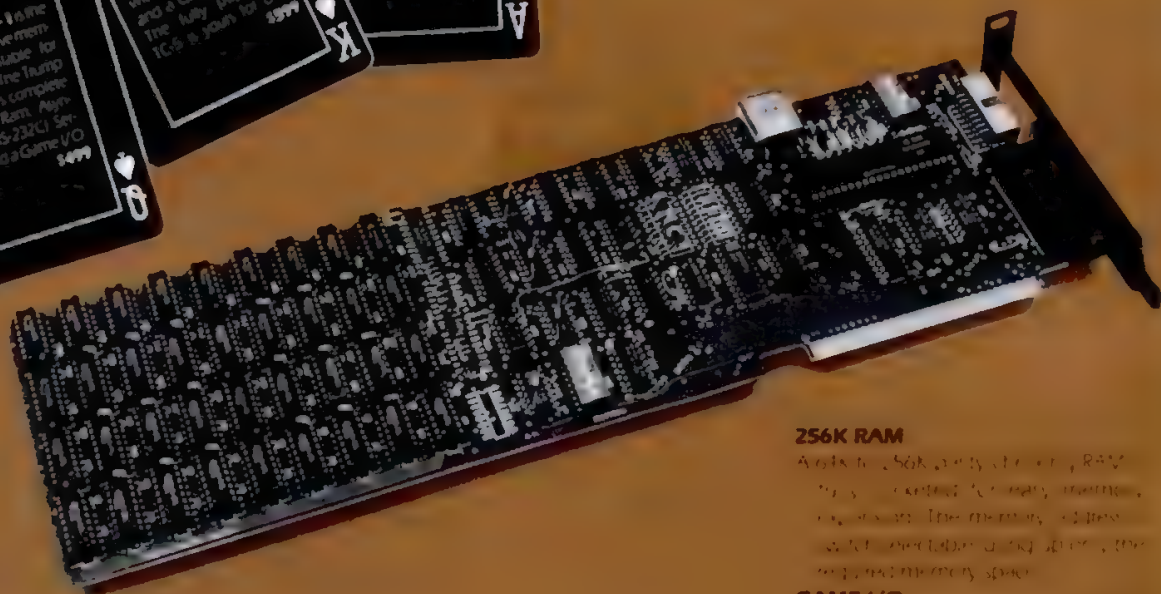
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*Now you can deal yourself a handful of function keys, defined to contain your choice of commands and strings.*

# Defining Function Keys With PC-DOS 2.0

PC-DOS 2.0 is packed full of new features. One is its ability to redefine the function of any key on the keyboard. Most often, users will want to redefine the ten function keys. In the following sections I will explain how to define function keys, tell how to use them, and alert you to some of the pitfalls. In addition, I will compare this capability of PC-DOS 2.0 with software packages such as ProKey, designed specifically for this purpose.

## Hidden Talents of 2.0

An item in PC-DOS 2.0 that is rarely looked at is the ANSI terminal handler, contained in the file called ANSI.SYS. When in memory, the ANSI terminal handler interprets special character sequences written to the console. Since each of these special sequences begins with the Escape character, these are called "escape sequences." The Escape character (ASCII 27) is referred to as Esc.

Oddly enough, many writers seem to overlook the potential of the ANSI driver. For example, Alan Boyd, in the April 1983 issue of *Softalk for the IBM*, states that "This facility is of little interest unless you are the rare user with a remote terminal attached to your PC. . ." As I hope to show in this article, such is not the case.

Basically, the ANSI terminal handler defines a way of positioning the cursor and setting certain terminal attributes. For

example, if a program were to write the sequence "Esc[12;43f", the cursor would be positioned at line 12, column 43. Other sequences control blinking, underlining, erasing to end of line, clearing the screen, etc. Thus, from any language (Pascal, BASIC, C, assembler, or what-have-you) you can precisely control the appearance of the screen. In addition, the ANSI terminal handler provides programmers with a tool for developing easily transportable software for compatible computers, regardless of the specific terminal characteristics of each computer.

The Keyboard Key Reassignment (KKR) escape sequence is of special interest. The KKR sequence establishes a new set of ASCII characters that are to be issued whenever the designated key is depressed. For example, one could define the F1 key to be "DIR A:". According to the PC-DOS 2.0 manual, any key on the keyboard can be reassigned, even the QWERTY keys. The manual, however, provides very little documentation on the KKR sequence. Worse, there are undocumented limitations!

Without getting too technical, PC-DOS 2.0 sets up a special area of memory as a look-up table for each key that you redefine. This look-up table is limited to 128 bytes. Thus, if you attempt to define too many keys, or use long character sequences on too many keys, the table size is

exceeded. If care is not taken, it will be exceeded to the extent that PC-DOS 2.0 meets its maker and you must reboot!

I speak from experience—I ran into the 128 byte limit like a brick wall. Knowing full well the difficulty others have had getting answers to technical questions from IBM through their local store, I dreaded calling my dealer. However, I learned that CompuShop and IBM are currently testing a new user hot line service. I received an answer to my question concerning the size of the look-up table in two hours. Good work, IBM!

## A Program for Redefinition

Now, how do you use this new PC-DOS capability? First of all, you must have a file on your boot disk called CONFIG.SYS. This file is read automatically by PC-DOS at boot time to determine the system configuration. In order to define the function keys, you must have a "DEVICE = ANSI.SYS" statement in the CONFIG.SYS file. This statement loads the ANSI terminal handler into memory. (The PC-DOS 2.0 manual includes more data about other options for the CONFIG.SYS file.)

Next, you must print a KKR sequence to the screen for each key to be defined. Since this can be tedious, I developed a special C language program for this purpose. This program, FUNKEY, is designed specifically for defining the function keys



Figure 1: Listing of FUNKEY, a C language program to redefine the function keys.

```

/*      FUNKEY.C - a program for defining function Keys      */
/*      Copyright (C) 1983 Kenneth W. Wood                  */

#define SEQ "\033[O;"    /* initial sequence to ANSI driver */
#include "stdio.h"        /* copy in the standard I/O routines */

main(argc,argv)
int argc;
char *argv[];
{
    FILE *fp, *fopen();

    if (argc == 1)
    {
        printf("\nEnter new key definitions\n\n");
        fkey(stdin);      /* get input from keyboard */
    }
    else
    {
        fp = fopen(*++argv,"r");
        fkey(fp);         /* get input from file */
    }

    int count = 0;        /* counter for tracking size of table */

    fkey(fp);
    FILE *fp;
    {
        int c,offset;
        /* input character and function key identifier */

        while((c=getch(fp)) != EOF)
        {
            switch (c)
            {
                case 'F':          /* F1 through F10 */
                    offset = 58;
                    func(getch(fp),offset,fp);
                    break;
                case 'S':          /* Shift F1 through F10 */
                    offset = 83;
                    func(getch(fp),offset,fp);
                    break;
                case 'C':          /* Control F1 through F10 */
                    offset = 93;
                    func(getch(fp),offset,fp);
                    break;
                case 'A':          /* Alt F1 through F10 */
                    offset = 103;
                    func(getch(fp),offset,fp);
                    break;
                default:
                    printf("Unknown function key\n");
                    break;
            }
        }
    }
}

```

F1 to F10, as well as Shift, Ctrl, and Alt in combination with the ten function keys. FUNKEY accepts a list of function key definitions as input and issues the appropriate KKR sequences as output. The program does not provide for the arbitrary redefinition of any or all keys on the keyboard. Sample function key definition files are discussed in the next section. The

**T**HE FILE  
STAR.KEY could  
contain a list of function  
key definitions for  
WordStar.

program is shown in Figure 1.

I created FUNKEY using the Computer Innovations, Inc. C language compiler, CI-C86. This is one of the few C compilers for the IBM PC that includes all standard C language features. FUNKEY, however, only involves simple input and output commands, so any adequate C compiler should be able to run this program. Similar programs could also be written in Pascal, BASIC, or other languages.

Use of the program is straightforward. When you type FUNKEY, the program is loaded into memory and begins execution. To define F3 as "CHKDSK B:" you simply type F3=CHKDSK B: then hit Return. After defining the desired keys, type a Ctrl-Z and hit Return. For a large number of keys, this method is inconvenient. Instead, you can type FUNKEY FILE.KEY to have the list of function key definitions taken from the file. For example, the file STAR.KEY could contain a list of function key definitions for WordStar.

### FUNKEY Applications

This article will not concentrate on programming techniques involved in FUNKEY. Instead, my emphasis is upon various ways of using the function key definition capability. The program provided here should be viewed as a foundation on which to build a more user-friendly key definition program. To increase the flexibility of the program somewhat, each



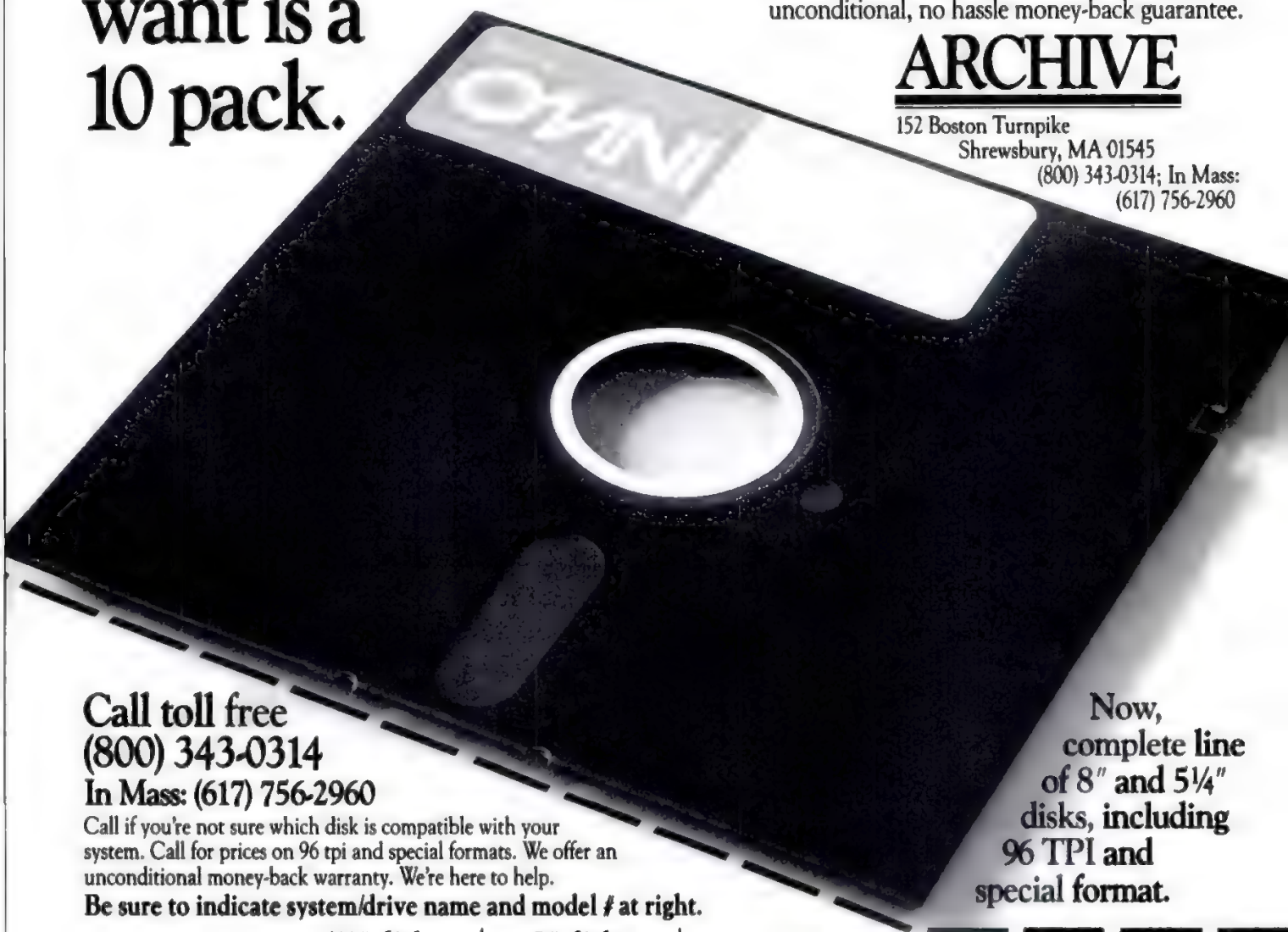
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function key definition is normally terminated with a space. However, if you need a command to end with a carriage return, simply use the "!" as the last character of that function key definition.

Applications of function key definitions fall into two broad categories: defining keys to issue commands, and defining keys with specific strings for use in an application. As an example for the first category, I find that DIR, TYPE, COPY, and CHKDSK are among the most common PC-DOS commands that I use. The file shown in Figure 2 illustrates the set of function keys for use at the PC-DOS command level. By including "FUNKEY DOS.KEY" in my autoexec.bat file, each time I use PC-DOS, I find all of the commands are just a function key away.

There are many ways that you can use the function keys at the PC-DOS level. For example, one key could be set up as "CHKDSK A:", and another as "CHKDSK B:". However, this approach is inefficient, since the same command appears on more than one key. I chose to set up F1 and F2 as "A:" and "B:". Then, by combining another command key with either F1 or F2 I can specify either disk. For example, typing F4 ("CHKDSK") then F2 ("B:") issues the "CHKDSK B:" command.

### Redefining Problems

A few potential problems should be considered. First of all, many popular programs already make special use of the function keys. For example, the program I

---

**T**HERE ARE  
many ways that you  
can use the function  
keys at the PC-DOS  
level.

---

principally use is The FinalWord. All of the function keys are already defined by this software and they can be customized with a FinalWord utility. The PC-DOS function key definitions, discussed above, would override the FinalWord definitions since they are intercepted by the operating system and passed to the program. How-

Figure 1: Listing of FUNKEY, continued.

```

getch(fp)
/* throw away white space until a character */
FILE *fp;
{
    int x;

    while((x=getc(fp)) == ' ' || x == '\n' || x == '\t')
        ; /* ignore white space */
    return(x);
}

func(c,offset,fp)
/* send out the required definition sequence */
int c,offset;
FILE *fp;
{
    int x,save;

    save = ' ';
    while ((x=getch(fp)) != '=')
        if (x=='0') c=':';
        /* read until get = sign */
        /* if character is 0 then F10 was chosen rather */
        /* rather than F1. Change c so that offset is */
        /* calculated correctly */
    printf(SEQ);
    printf("%d",offset+(c-'0'));
    putchar(':');
    putchar('"');
    while ((x=getc(fp)) != '\n')
    {
        if (x != ' ')
        {
            putchar(x);
            if ((count = count+1) == 128)
            {
                printf("\nTable size exceeded. Program terminated...\n");
                exit();
            }
        }
        else
            save = x;
    }
    putchar('"');
    if (save == '!')
        printf(";13p");
    else
        printf(";32p");
    save = ' ';
    if ((count=count+1) == 128)
    {
        printf("\nTable size exceeded. Program terminated...\n");
        exit();
    }
}

/* End of listing */

```



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Figure 2: After running FUNKEY, the following PC-DOS 2.0 commands are assigned to the ten function keys. F1 to F10 are the input file names of the function keys in their normal state; C1 to C10 are the names for the keys in combination with the Ctrl key.

F1=A:	C1=MORE
F2=B:	C2=Find
F3=DIR	C3=Sort
F4=CHKDSK	C4=MODE
F5=copy	C5=PATH
F6=ERASE	C6=Tree
F7=TYPE	C7=MKDIR
F8=PRINT	C8=RMDIR
F9=RENAME	C9=RECOVER
F10=CLS	C10=FORMAT

ever, there is no documented way to clear the definitions you use. So far, the only method I know of to restore the default set of key definitions is to reboot the system. This was confirmed by IBM.

On the other hand, the fact that your definitions override existing definitions

can be a blessing as well. As Corey Sandler pointed out in "Doing It Your Way With ProKey" (PC Magazine, Volume 1, Number 9), some of the choices made by MicroPro for the PC-DOS function keys defy logic. The key arrangements in many other programs are equally illogical. In some cases, you can use the capabilities described here. However, if a program bypasses the normal operating system calls in order to perform keyboard input, then the key definitions you created are also bypassed. Such is apparently the case with WordStar, since an attempt to redefine function keys for WordStar failed to over-ride the existing definitions.

Finally, each key definition sequence must end with "white space"—that is, a blank or a carriage return. The ANSI driver seems to use these characters as separators between new definitions. I tried terminating the definitions with other characters, such as the null, with the result that all of the key definitions ran together into one giant sequence. There is no problem in using this capability to define

strings. However, some programs do not like a space or carriage return after a sequence of control characters.

### Batching Keys and Programs Together

Using the capability to reset the function keys can create another minor prob-

## ANOTHER WAY to use function keys is with commonly used strings.

lem. Suppose that you set the keys up for WordStar, then switched to VisiCalc. The key definitions are no longer appropriate. I find it annoying to constantly remind myself to switch to the proper function key set. The best way to painlessly use the function keys is to write a batch file for each program. The batch file takes the generic form:

```
FUNKEY APPL.KEY
Application
FUNKEY DOS.KEY
```

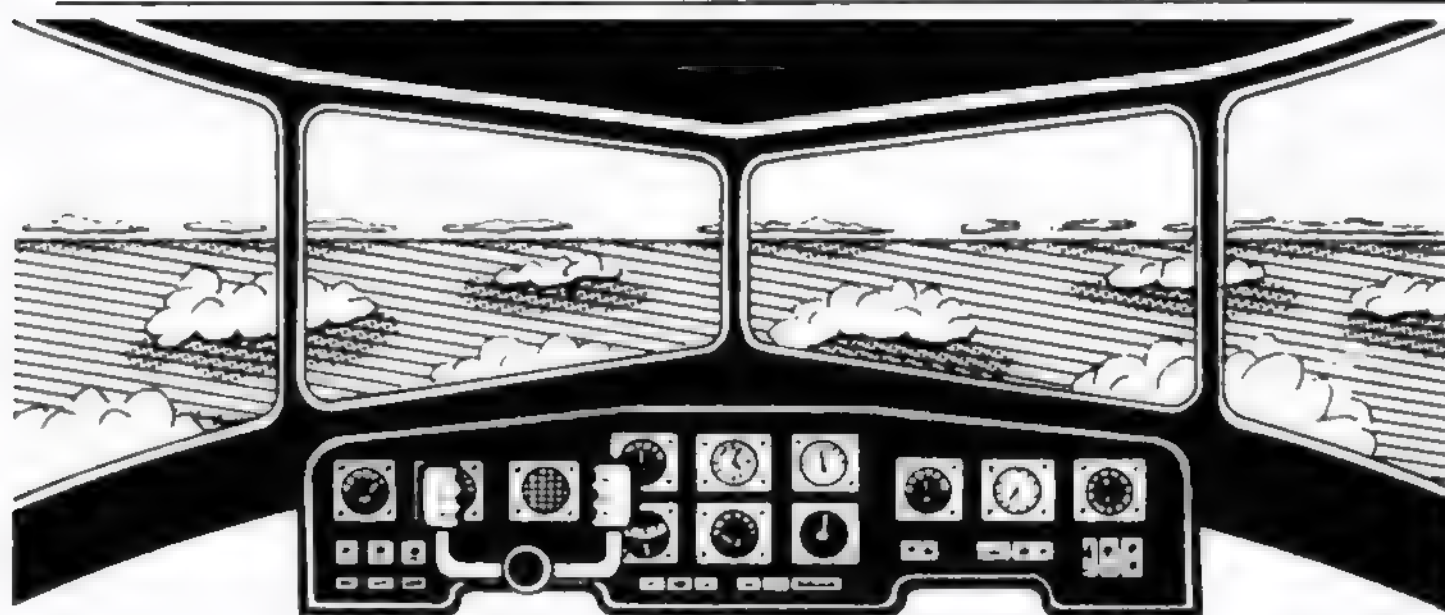
This file loads the definitions for an application, calls the application, and resets the keys for PC-DOS after you exit the application. For example, if STAR.KEY was a file of the key definitions for WordStar, then I would create a batch file called WORD.BAT. Its contents would be:

```
FUNKEY STAR.KEY
WS
FUNKEY DOS.KEY
```

To use WordStar, I call up the batch file by typing WORD rather than WS.

### Strings on Function Keys

Another way to use the function keys is with commonly used strings. For example, suppose that your company name is "Federated Software Arts and Science, Inc." You could assign a string with the company name to a function key. Then, as you use your word processor, whenever the company name is needed, you just



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press that function key. Or, in writing an article on a specific subject, frequently used lengthy terms such as "operational transconductance amplifier" can be assigned to function keys and used as needed. If you do this, remember that PC-DOS restricts you to 128 characters as the total for all the keys that you define.

#### Programs with Better Definition

I am aware of at least two programs, written for use with PC-DOS 1.0 and 1.1, that provide function key capabilities: ProKey and Keynote. Both ProKey and Keynote provide many more key definition capabilities than PC-DOS 2.0. First of all, there is no 128 byte restriction. ProKey, for example, provides over 125 definable keys, and each key can be up to 1,000 characters long. Furthermore, key definitions can include "fill-in-the-blank" fields and references to other defined keys. ProKey is memory resident, which means that you can change the key definitions anytime while in a program. Thus, ProKey can provide a macro-like capability. The possibilities provided by ProKey or Keynote are endless. For more information and potential applications, see "Doing It Your Way With ProKey" (PC Magazine, Volume 1, Number 9.)

**THE TIME**  
*you spend exploring PC-DOS 2.0 can be well worthwhile.*

Function key redefinition is one of the new capabilities provided by PC-DOS 2.0. Although useful, this capability is still limited compared to commercial programs designed specifically for the purpose. However, the examples in this article should illustrate that the time you spend exploring PC-DOS 2.0 can be well worthwhile. Who knows what additional capabilities lie hidden within the code of PC-DOS 2.0? /PC

Kenneth Wood is a software systems engineer for Texas Instruments in the Dallas, Texas area.

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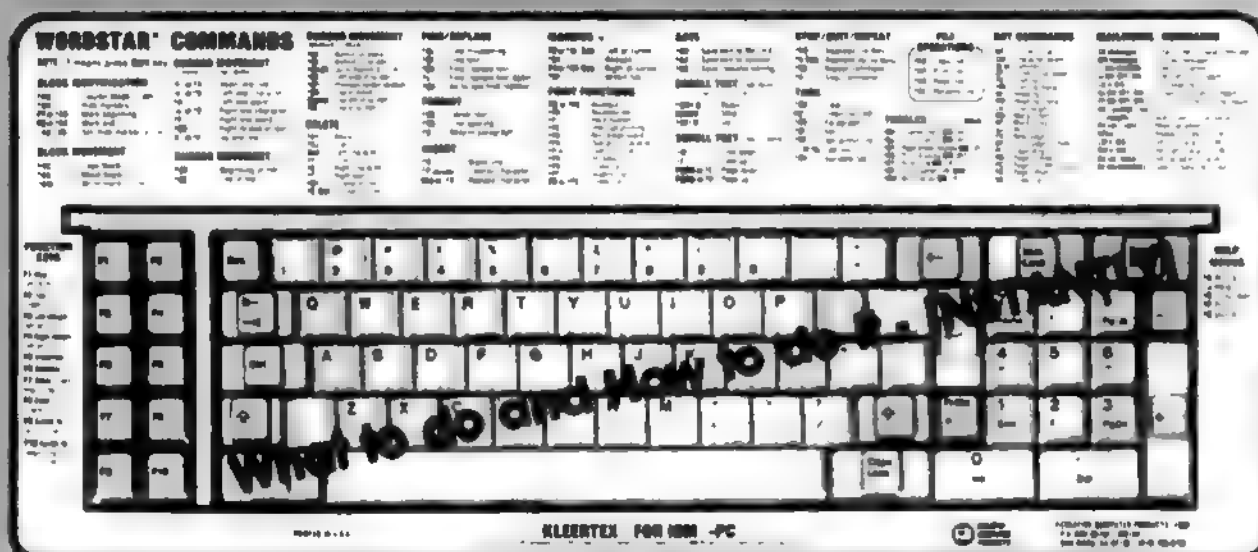
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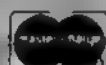
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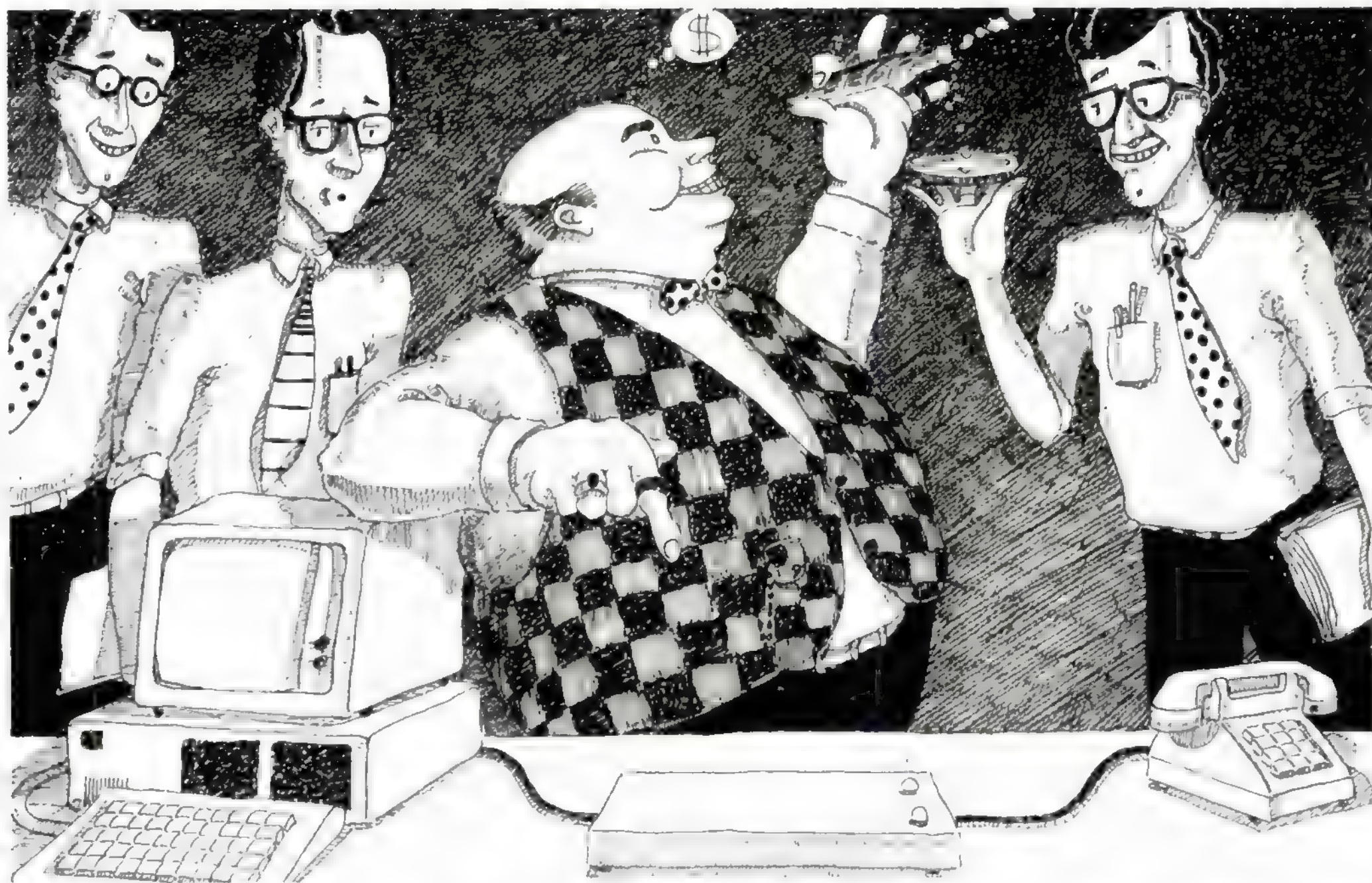
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Forestville, CA 95436  
(707) 887-7237

**List Price:** \$29.95

**Requires:** 64K RAM, one disk drive, Hayes Smartmodem.

**CIRCLE 690 ON READER SERVICE CARD**

would anyone buy a program that does nothing more than store phone numbers and dial them automatically? I can think of three answers. To show off the computer to friends. To call relatives or business associates, one right after the other, in order to give them each a similar message ("It's a boy!" or "The labels on the bottles of Ipecac and Dramamine were switched.") Or quite possibly, to take the sting out of the \$600-plus price tag for the Hayes Smartmodem 1200 required to make this program work.

There's bound to be someone out there

who will decide he needs Auto Dialer because he doesn't want to bother dialing someone's number manually. So after he gets it, he will (1) remove the dust cover from his PC, (2) look for his DOS disk and insert it, (3) turn his computer on, (4) wait for it to boot, (5) look for the Auto Dialer disk and insert it, (6) fumble through the first few program steps to get to the automatic dialing menu, (7) turn on his modem, and (8) hit the proper sequence of keys. It is possible to make the disk auto-booting and to skip the dust cover routine, but that still leaves a half-dozen steps.

Before we begin, one question. Why



Perhaps Auto Dialer was created simply because everyone hates to look up numbers and punch or dial them in. Or because it's neater to keep your telephone numbers on a disk rather than scribbled on scraps of paper or the backs of envelopes and cocktail napkins. But is this really necessary?

The program hails from Alphanetics, a company that advertises games such as *Contraband* ("You're a smuggler . . . dealing in illegal drugs . . . you scramble for the best deals . . . the mob had better get their cut . . . you'll play for hours just to get that one big score!") and *Prosthesis* ("you'll soon realize what a prescription we have for stimulating, X-RAYted fun . . . you'll be having such exotic/erotic fun, you may never want to quit—if you can keep it up! . . . Great fun at parties!").

According to the ad, Auto Dialer requires a "Hays" Smartmodem, but I suppose the one manufactured by Hayes might work. And unless the program manages to steal some shelf space at your local computer store, you have to order it

through a post office box.

### Missing Instructions

The first thing you notice when you remove the disk from its spiffy plastic bag is that there is no documentation whatsoever. There are, however, three pieces of

**T**HERE IS  
no documentation  
whatsoever.

stiff paper. One has a cutout picture of an IBM PC. The second boasts a two-sentence product description and a few lines containing the price and the company address. The third is a bright orange sheet that says "This manual is copyrighted."

Fair enough. Maybe the program is so easy to use that you don't need instructions. And to tell the truth, the pro-

gram is pretty simple. After all, how complex can a phone dialing program be?

When you boot Auto Dialer, you are offered the chance to run through a few brief one- or two-line instruction screens. Unfortunately, if you tap the space bar a dozen times, the instructions zoom by like Burma Shave signs. Interesting philosophy here: present one and only one fact to the user at a time, as if comprehending more were out of the question. You can tell without looking at the label that this was made in California.

If you skip these koan-like instructions, you can plunge right into the guts of the program. After much sputtering and disk-churning, Auto Dialer confronts you with the single word "INITIALIZING." Then, every few seconds, just when you think the program has died or is hopelessly snarled in some internal Boolean crash, it grinds the disk to remind you it's still hanging in there.

You get to pick your data disk and confirm your selection. If your modem is not turned on, you get a warning. Don't have a

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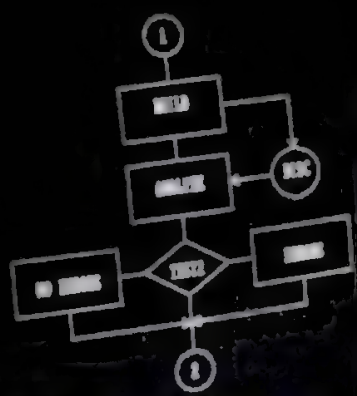
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modem connected? This program doesn't care. It plows blithely on. This lets you add or change names in your directory even if you don't have a Hayes handy. If you try to dial without a modem, that's another story; you receive a repeated stony, implacable message telling you to switch the thing on.

The Auto Dialer main menu scrolls onto the screen, and snaps, crackles, and pops madly away while it waits for you to make a choice. A small digital clock at the top of the screen throws off clouds of little white sparks like the Van de Graaff generators in old Frankenstein films, and a dancing cursor-like object bounces uncontrollably up and down along the left margin. The real cursor pulsates slowly in the lower right-hand corner. The main menu allows you to either add an entry (A); dial from a printed phone code number (B); change or delete entries (C); dial by name or letter search (D); exit from Auto Dialer or select data drive (E); get a printout of your phone number list, (F); change modem specifications (G); or change COMNET parameters (H).

### Entering Your Directory

Before you decide to purchase Auto Dialer, the first thing you might want to do is see what names come with the system. All that were in ours were five dead American presidents and the Newfoundland, Canada, office of Jordache Jeans. Must have been a wild party.

Since I couldn't imagine ever needing any of those numbers, I erased them. This is not as easy as it sounds. First, you have to print out a list so you can see what

credit, it uses single keystroke commands in most places and has many built-in two-step verifications and data protections.

You can enter the first initial of a last name from your existing directory, then jump forward and backward by punching the plus and minus signs. Since the program must check the disk each time you want a new name, however, each request is accompanied by a symphony of drive motor coughs and wheezes. If you do want to delete a name, you must type in Y-E-S. If you only type in Y, the program thinks you mean NO. I guess this was meant to be a safeguard, but it's a trifle tedious.

The same editing screen lets you change or delete listings, and changing an entry is predictably straightforward. Each file can include a last name (as distinguished from the given name, so the listings can be sorted alphabetically), first name, area code, phone number, and a 26-letter message. (If you want to store the alphabet you're in luck.) The only way to list separate work and home numbers or to tie related files together is to type in some cryptic reference in the comment space.

---

**A**FTER ALL,  
*how complex can a  
phone dialing program  
be?*

---

names you want to erase. Then, you have to go into the delete mode and enter either the last name or part of it. To the program's

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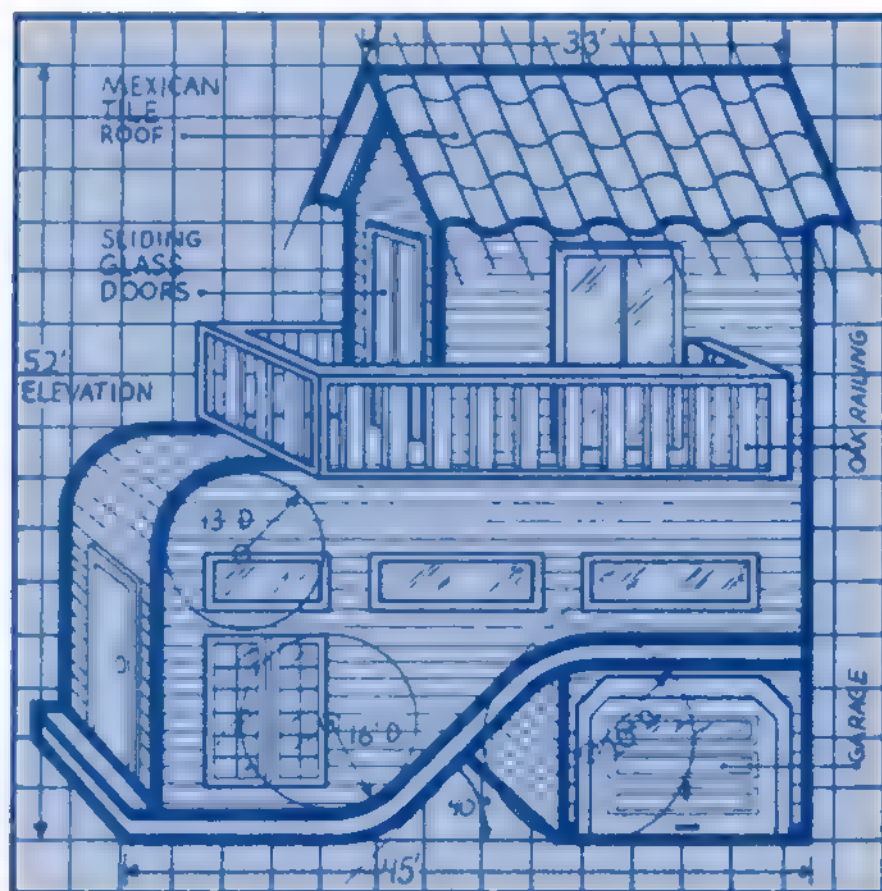
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There's no room for an address unless you're good at compressing a number, street, city, state, and zip into a space about two-thirds as wide as this column.

Entering information is also difficult. The program does everything in upper-case characters only, regardless of whether you enter them in upper or lowercase.

**J**UST WHEN  
*you think the program  
has died, it grinds the  
disk to remind you it's  
still hanging in there.*

Although it knows what a hyphen is when you enter a phone number, the program ignores it, which causes momentary confusion. Instead of trying to catch errors at the start, it waits until you've finished typing in the data, then stops to verify it.

You can generally jump back to the main menu from the middle of any operation, but when you try this after entering a name or going to the Enter screen, the program laboriously re-sorts all the entries in alphabetical order. While Auto Dialer juggles all the listings, you can pass the time dialing the phone number yourself.

Once you've copied your Rolodex onto a disk, you may dial a number either by typing in the number that Auto Dialer has assigned to the file or by typing in the last name. Unless you're making long distance calls using a non-AT&T system, it usually takes more keystrokes to tap in the last name than to dial the number.

## **More For Your Money**

Of course, Auto Dialer does look up phone numbers. If you think this is worth \$29.95, then this program is for you. Many communications programs include auto-dialing features, however, so if you're thinking of purchasing a full-fledged telecommunications system, you might get one tossed in for free. One more thought. At a dime a throw, you might even come out ahead by dialing Information. If you could speed up the program and keep it on a hard disk, it might be interesting to have around the office. Otherwise, it's strictly a wrong number. /PC



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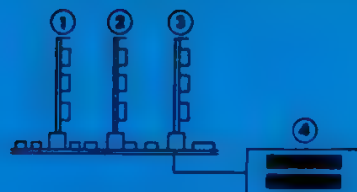
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CIRCLE 629 ON READER SERVICE CARD

When first you hail the Columbia, you may find yourself doing a bit of mental measuring. In this day of smaller-is-better, Columbia Data Products has taken the more traditional approach: It has produced a "PC" grown wider, longer, and heavier. But to hear the company boast, it's also a PC grown a bit more useful, and priced at a discount.

The Columbia qualifies as a full-fledged PC work-alike. It accepts all hardware options designed for the IBM machine and runs virtually all software written for its worthy mentor. It was the first of the copycats to gain wide distribution, and has made its market on the basis of price and feature comparisons to the PC.

The base model Columbia MPC 1600-1 includes 128K RAM on the motherboard, two RS-232C serial ports, a Centronics parallel printer port, a color/graphics display adapter, two floppy disk drives of the same configuration as IBM's, and a Winchester hard disk drive interface. With these features already in place, the Columbia leaves seven of its eight expansion slots open. (The PC has five slots, all of which could be taken similarly.)

Columbia has been aggressively marketing its equipment as a cost-effective



Front view of Columbia with optional Amdek monochrome monitor.

alternative to IBM's product, with several reductions in price since the introduction of the machine in the summer of 1982. In late April of this year, Columbia dropped the price on the basic model to \$3,395 and added into the box a package of software that it claims has a value of about \$3,000. The "bundle" includes Perfect Software's word processor/spelling checker programs *Perfect Writer* and *Perfect Speller*, the database manager *Perfect Filer*, and the spreadsheet *Perfect Calc*. (This was a

slightly unusual act on the part of Perfect Software since it meant that the "official" release of its 8088-version package was for a PC-compatible, rather than for the PC itself.)

In addition to these applications programs, Columbia also includes *Fast Graphs*, a business graphics program (see "Fast Graphs: Quick, Colorful, And Easy" in this issue); the *Home Accountant Plus* financial program; an asynchronous communication package; an arcade game; and



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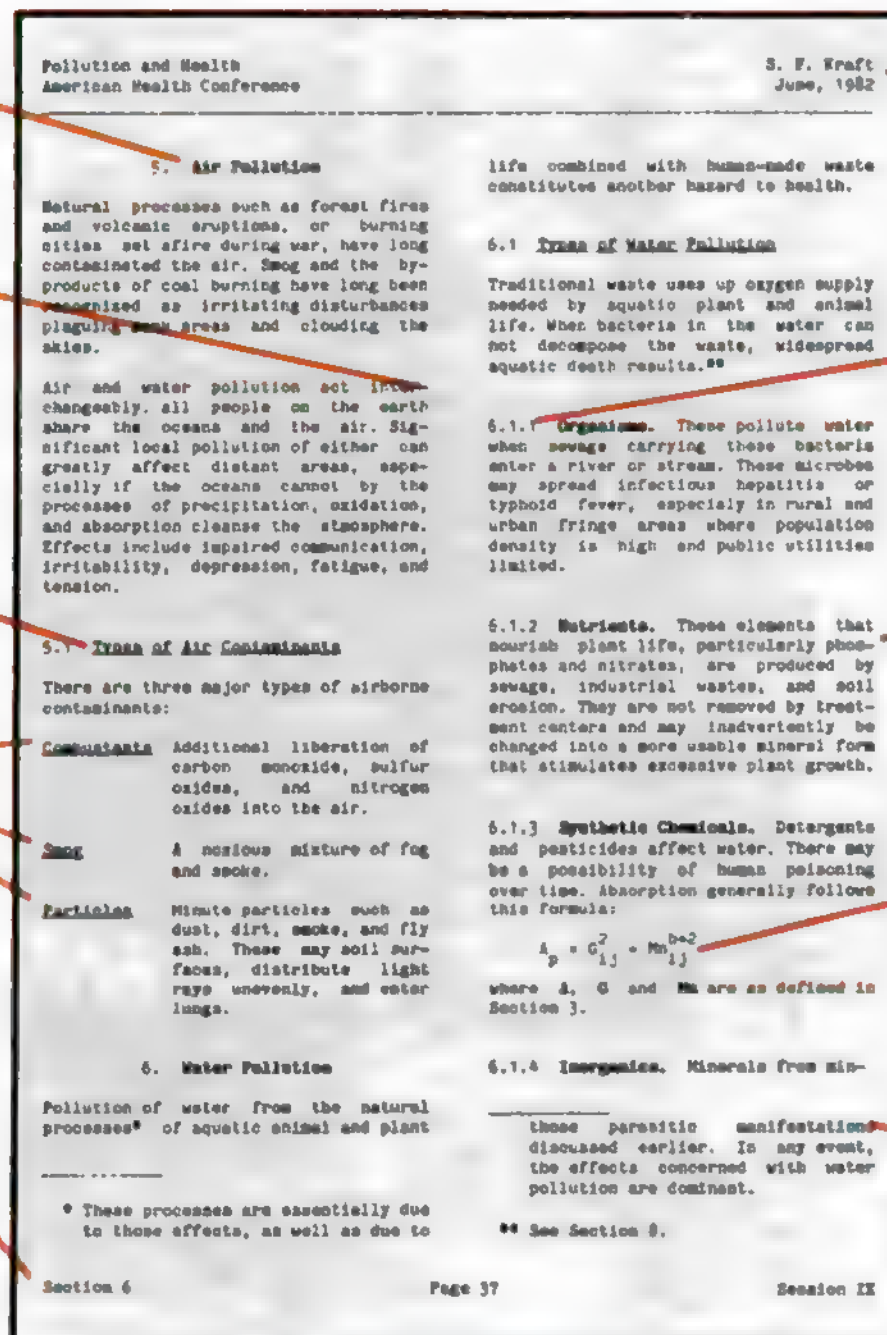
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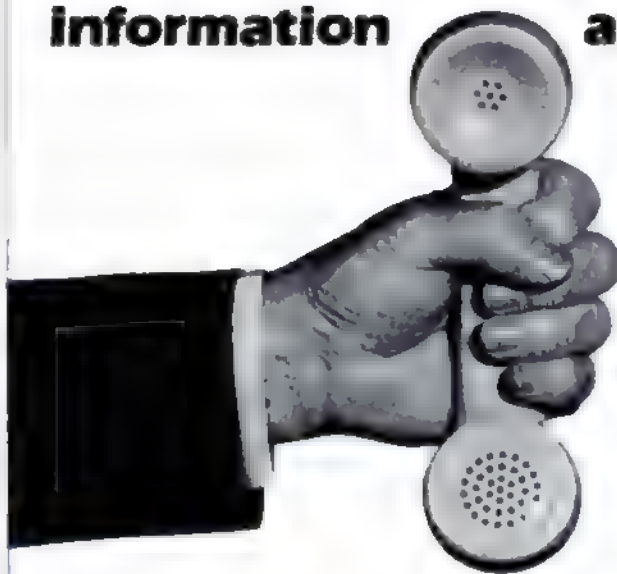
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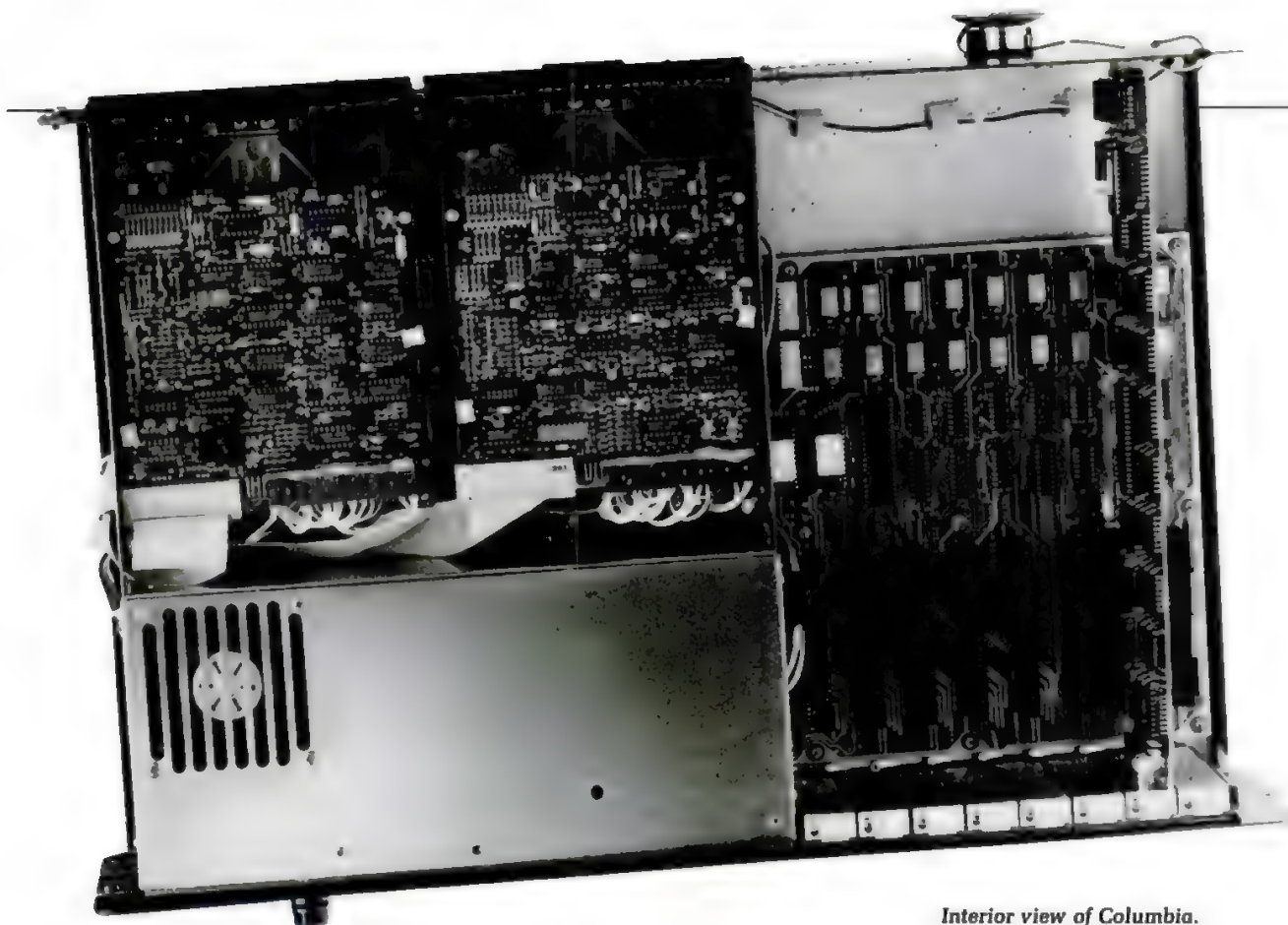
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Interior view of Columbia.

## Aboard the Columbia

*Capable of supporting the MS-DOS, CP/M-86, and MP/M-86 operating systems, Columbia's Multi-Personal Computer is a multi-purpose, multi-personality machine.*

The Multi-Personal Computer is the latest offering in the PC-compatible market from Columbia Data Products. Its name implies that it has multiple personalities, and its advertisements imply that it is a multi-user machine. Both implications are true. The Columbia includes MS-DOS and the CP/M-86 operating systems, as well as MP/M-86, a multi-user operating system.

The Columbia's hardware design supports its multiple software personalities. The motherboard consists of an 8088 microprocessor running at 4.77 MHz, an obligatory 8259A interrupt controller, and an 8237 Direct Memory Access (DMA) controller. These components are necessary to ensure IBM compatibility. The motherboard also includes 128K RAM and eight expansion slots, as well as a floppy disk controller, two serial ports, and two parallel ports. As you might expect, it is quite a bit larger than IBM's

motherboard, measuring 10 × 20-inches. It covers the entire bottom of the cabinet. One of the parallel ports is tailored for use with a Winchester disk, with its own connector located on the front of the board. High performance Winchesters won't use this port, however. Instead, they would use the more conventional card in one of

**I**F YOU'RE A  
first-time user, you'd  
better have a good  
dealer behind you.

the expansion slots. Although I didn't have an opportunity to test the Columbia with the Winchester controller and a hard

disk, the specs are interesting because of the on-board cache buffering. This is the same design approach as IBM's new disk controller, and it affords high throughput and access speeds without burdening the central processor with hard disk control functions. A Z-80 handles all the Winchester and memory housekeeping, managing 11 8-sector buffers in its 64K on-board memory.

If you are running the Columbia with MS-DOS in its IBM-compatible mode, you can install a standard monochrome or color video display card and a keyboard—in this case, the Key Tronics IBM clone. You can use the same setup to run CP/M-86, but most CP/M machines use conventional computer terminals rather than the keyboard/monitor/display controller card combination found in the PC. Columbia provides for this by allowing one of the serial ports to be used as the system console. Its ROM (program stored in read-only memory) supports either. If you were to run the MP/M-86 operating system, however, you would need more serial ports and more memory. The six terminals



# ***THE COMPARISON*** ***is \$3,395 for the MPC*** ***and about \$7,000 for the*** ***PC.***

a tutorial program. Finally, the kitchen sink also includes the MS-DOS and CP/M-86 operating systems, BASICA, and the Macro/86 Assembler.

"If we're going to remain under IBM's umbrella, we need to maintain an edge," said John A. White, vice president of marketing and sales for Columbia Data. "We must offer a value better than IBM's."

How much of a value is Columbia? The list price for a comparably equipped IBM PC would be \$3,437, plus the cost of a Winchester hard disk interface and the software package. If we take Columbia at its face value, the comparison is \$3,395 for the MPC and about \$7,000 for the PC.

The top of the line for Columbia is the MPC 1600-4, which includes a 23-mega-

byte (10-megabyte after formatting) hard disk and a single floppy disk drive. The list price, including the software package, is \$4,995.

## **Not Bad For Rookies**

Is anyone buying? According to White, shipments are expected to reach about 1,000 a month in May, which is "not bad for a bunch of rookies." The company is selling through a group of distributors across the country, and its products have also turned up in the listings of discount mail order operations. The company also offers a "Call for Columbia" national service program.

Columbia has not stopped in its tracks to count the incoming cash, however. "We want to be the only vendor with a complete line of IBM compatibles," White said, "Uniqueness is counted only in a matter of days in this industry."

According to White, users can look forward to these new products from Columbia: a PC-compatible portable called the "VP," which will list for \$2,995, includes

two half-high disk drives and a 9-inch green screen, and will be marketed with the same package of software that its big brother now offers; and a pair of expansion units that offer 10- or 20-megabytes of formatted hard disk space for the MPC or 10 megabytes for the MPC Model 4. Columbia hopes to make the expansion boxes compatible with the IBM PC and the PC-XT too.

Columbia Data does not offer a machine that is inherently better than the

# ***THE COLUMBIA*** ***qualifies as a full-*** ***fledged PC work-alike.***

IBM PC. The machine works, period. About the only thing you don't get with a Columbia is the IBM logo, and that is a value that can only be determined by the consumer himself. /PC

flanking the Multi-Personal Computer in Columbia's ads may be a bit optimistic given the limitations imposed by an 8088 running at 4.77 MHz. Since serial terminals do not provide the system reset function provided by the Ctrl-Alt-Del on the IBM-compatible keyboard, the Columbia is equipped with a reset button.

In terms of performance, there is no measurable difference between the Columbia and a similarly equipped IBM PC. Of course, you do have to load the entire BASICA, since there is no ROM-resident BASIC in the machine. This takes about a second longer. Choosing between IBM's keyboard and the Key Tronic Soft-Touch is a matter of taste. (I prefer the Soft-Touch; I'd like it even better if it were the new keyboard that resembles the IBM Selectric rather than a PC look-alike.)

## **Hardware Design**

The overall design of the machine is for the most part well-conceived, although there is still room for improvement. For example, the motherboard is laid out well, with large power traces and many bypass capacitors. It is spacious and provides easy access to components. Unfortunately, a series regulator stands right in the

middle of the expansion sockets. Although this doesn't directly interfere with the use of the sockets, you must be careful not to bend it while inserting a board, and

# ***IN CONTRAST*** ***to IBM's new PC-XT,*** ***the eight expansion slots*** ***are full-sized.***

you must be sure that the components on the expansion board will not hit it when the board is fully seated. I also wonder about the design of the data separator/clock recovery circuitry in the floppy disk controller. Although most manufacturers blanket that area of the circuit board with ground planes to ensure stability, the Columbia has only standard sized traces. The circuit design is more complex than is customary, but appears reliable. David Howse, the designer of the Columbia, says that the controller circuitry is now being revised for greater simplicity.

The case itself is stamped sheet metal

and its appearance is pleasing, but the fit and finish are somewhat inferior to those of the competition. The power supply and disk drives are integrated into a subassembly "tray" that rides between the front and back panels. Removing it is a bit like solving a Chinese puzzle: Which piece comes out first? Although the average user will probably never have occasion to remove the tray, he would find it troublesome should the need arise. The disk drives are full-size Tandons, with 320K per drive. In contrast to IBM's new PC-XT, the eight expansion slots are full-sized. My test system did not have any card support guides, however, and the front edges of the cards were free to move laterally, increasing the possibility of damaging a card during installation or removal.

The documentation for the Columbia is far below the standard set by the PC and other computers in the same market. It consists of a single 8½ × 11-inch booklet containing a few pages of operating instructions. Most of the information it contains was copied from the data sheets from the major large-scale integration (LSI) chips on the motherboard. This information might be nice to know, but I can't understand why the average user



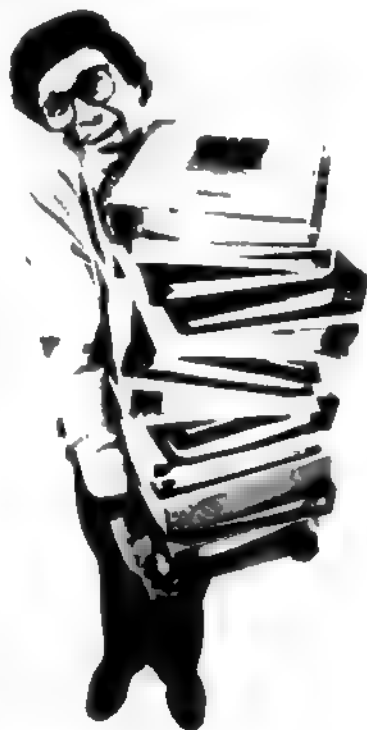
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would care about what the status bit structure of the disk controller looks like. I can understand why a manufacturer would shun the expensive "book in a box" approach taken by the leaders in the industry, but I'm at a loss for words to describe Columbia's alternative to this.

**THE COLUMBIA'S**  
*hardware design*  
*supports its multiple*  
*software personalities.*

Columbia is probably counting on the documentation provided with the operating systems and the languages that you choose to carry you along. Although this type of documentation has come a long way, it's still the manufacturer's responsibility to tie it all together. If you've already done some systems integration and hardware expansion on a PC, you should have no problem doing the same on the Columbia. Similarly, experienced CP/M users will probably have little difficulty using this machine. If you're a first-time user, however, you'd better have a good dealer behind you.

The power supply is rated conservatively at 100 watts, although spokesmen for Columbia say that it can supply 130 watts before its self-protection circuits break down. Two amps for the motherboard, 2 amps for the hard disk controller, plus two more for the drives leaves roughly 0.8 amps per expansion slot.

### Roomy

The Columbia has some attractive features, not the least of which is room for eight full-sized expansion boards. These will come in handy if you opt for multi-user operation, which may entail more memory, more I/O ports, a hard disk, and perhaps a different CPU. The optional operating systems are supported by Columbia, which is important from an ease-of-installation standpoint. Although there are a few weak spots in the overall package, none of them impinge on the performance of the Columbia, and the manufacturer is evidently working to overcome them.

—Bill Machrone



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Without software, a computer can't do anything. And vice versa. You have to buy both.

## **Buy the software first.**

Since the reason you're buying a computer is to get the capability the software gives you (remember it's the software that tells the computer what to do), it makes good sense to pick the software first.

Start by making a list of the things you want the computer to do. Possibilities include word processing, inventory control, accounting, graphics, recordkeeping—you name it, there's probably software that does it.

Next take your list into a computer store and ask the salesperson to demonstrate software that will do the things you want.

Even though you'll need a computer for the demonstration, keep in mind the computer is just a vehicle. The software is the driver. Once you've decided on software, picking the rest of the computer system will be that much easier.

## **The simpler the better.**

Some people will tell you that software has to be complicated to be powerful. Nothing could be further from the truth.

Good personal software should be, as the computer people say, "friendly." Meaning that it helps you do what you want to do without getting in the way.

Good software keeps the complications in the computer, where

they belong. And keeps the capability at your fingertips. It's that simple.

## **Simply see for yourself.**

You can read any number of interesting books and magazines about personal computers. You can ask your friends who have them.

Or look at all the sales literature you can get your hands on.

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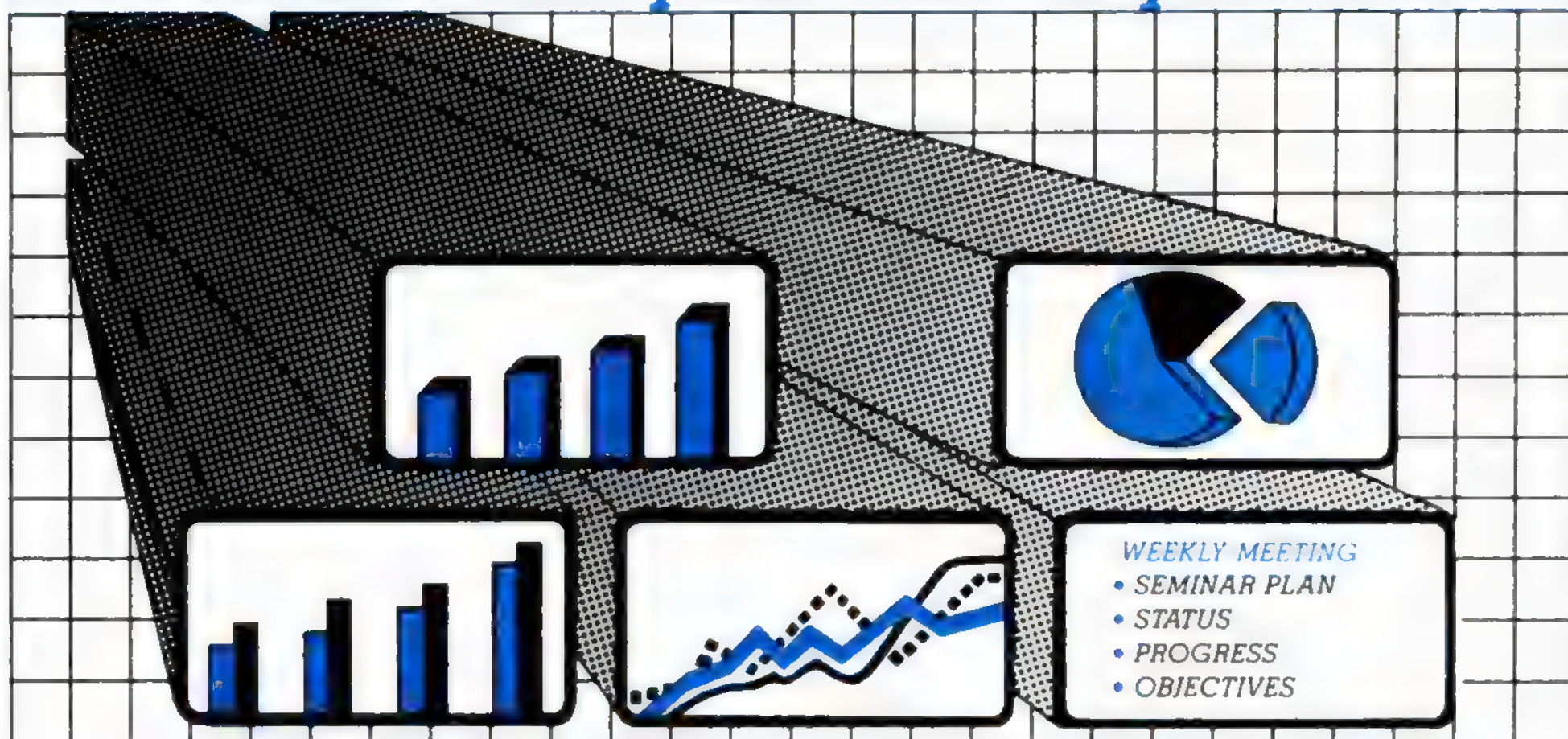
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CIRCLE 257 ON READER SERVICE CARD

PC MAGAZINE 456 JUNE 1983



*Flight-related games for the PC are akin to pre-Wright Brothers attempts to take wing: good ideas that never really get off the ground.*

# Terminal Jet Lag

## **Flight Command**

Lighthouse Distributing  
P.O. Box 10938  
Bainbridge Island, WA 98110  
(206) 842-5557

**List Price:** \$49.95

**Requires:** 64K RAM, one disk drive, PC-DOS 1.1, color/graphics or monochrome adapter, monitor.

**CIRCLE 559 ON READER SERVICE CARD**

There's a fable about a talented inventor who wanted to develop the ultimate soft drink, an uncola. He called his first version "One-Up," his second try, "Two-Up"; and his third, "Three-Up." Each version was pretty good, but never caught on. "Enough is enough," he finally decided, and quit his work with "Six-Up."

The same situation occurs with *Flight Command* from Lighthouse Distributing. If there had never been a *Flight Simulator* from Microsoft, this program might have become a real winner. But good as it is, *Flight Command* pales in comparison to the newer product, which has gained a foothold on the upper echelons of soft-

ware sales for the IBM PC.

When I took a few passes at flying lessons a number of years ago, there was one element of the course that terrified me more than any other—flying "under the hood." In this advanced phase of instruction, a set of blinders was placed on my head, allowing me to see only the instruments; there was no way to look out the window. I was forced to rely on the instruments to tell me the direction I was flying in, whether or not my wings were level, my rate of climb or descent, and other important information. Some instructors have been known to turn the plane upside down as the "hood" is installed to see if the student notices.

## **Under The Hood**

In effect, this is what *Flight Command* offers—a chance to fly "under the hood" with one of six aircraft: a Cessna 150, a common two-seater used for training and entry-level flying; a Pitts Special, a one-seater acrobat; a P-51 Mustang, a high-speed military propeller plane; an F-14 Tomcat, a contemporary military jet that

can cruise at 1,564 mph; a Boeing 747 behemoth; and a Concorde SST speed champion cruising at 1,680 mph.

The display for the F-14 Tomcat shows altitude, airspeed, course, fuel, pitch, roll, VHF Omnidirectional Ranging (VOR); Distance Measuring Equipment (DME); Instrument Landing System (ILS) display; RPM for each engine, flaps, wing and skin temperatures, gear status, power rating, and elevator, rudder, and aileron readings. Your plane's position and destination are also shown, displayed as longitude and latitude coordinates.

You may choose one of 179 different destinations, ranging from Adak Island (between Alaska and the Soviet Union) to Los Angeles to Zanzibar, and many points along the way. Selection of a destination is completed during the course of "radio" communication with the control tower or with flight controllers along the way. As you move toward your destination, the instruments give your bearings.

A chart included with the game advises you of fuel capacity, cruising speed, and range for each of the planes, as



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CIRCLE 301 ON READER SERVICE CARD

well as the cruising speed, altitude ceiling, and stall speed (the combination of decaying speed and angle of attack at which the plane's wings lose their ability to maintain lift). The Cessna 150 has the shortest range, and is capable of taking you nearly 400 miles if you manage your flight properly. The Boeing 747 and the Concorde have the longest range. A three-color wall map shows the airports available to the plane you select.

## ***F**LIGHT Command offers a chance to fly "under the hood."*

If all this sounds complex and challenging, it is. Unlike its competition, however, *Flight Command* does not make much use of the advanced graphics of the PC. All you see are the digital readouts of most of the instruments (this information is supposed to be sufficient for any pilot with an instrument rating). Your radar display is merely a schematic. There is no "view" outside the window, one of the major "Gee, whiz" effects of *Flight Simulator*. There are no sound effects except for an occasional warning beep or a Klaxon (which signaled my constant crashes).

### Checkout Hassles

Part of the *Flight Command* fiction involves the maintenance of a set of books for each "pilot." When you boot up the game (under BASICA, using a color/graphics adapter and a monochrome or color monitor), you arrive at the "Aircraft Checkout Counter" where you are asked your name. If you've flown before under that name, you'll then see a log book that records the number of hours you've flown, your crashes, your earnings, and the balance of your American Express account. I found this part of the program rather silly. What's more, I never managed to accumulate any money in my earnings register, since each of my crashes was charged to the American Express card. I wonder if Karl Malden ever had that problem?

From the checkout counter, you pro-

ceed to the Flight Line, where an attendant again asks you for your name, which seems unnecessary. Then, depending on the number of hours you've logged in the air, you're offered a choice of planes. It is possible to avoid most of the checkout game by merely booting up the name of one of the planes from within BASICA, using a command such as RUN "747.BAS".

Your controls in midair include an autopilot that keeps the plane level and on course, a help command, controls used to set flaps, ailerons, a rudder, an elevator, and a throttle.

Unfortunately, Lighthouse Distributing does not provide an instructor. The "manual," if you can call it that, is pitifully short and vague. There is no information on the theory of flying, no single gathering of all of the controls, and not even a box-by-box explanation of the various elements of the television monitor instrument panel. There was a two-page insert called "Hot Tips" included in the package I reviewed that added some but not all of the necessary information.

I'm afraid that *Flight Command* almost resembles one of those "Airport" disaster movies in which the pilot, copilot, engineer, and most of the crew and passengers have been struck down by poisoned airline food (a redundancy?), leaving only a little old lady from Dubuque who has never been in a bus before, much less a jet

***U**NLIKE ITS  
competition, however,  
*Flight Command* does  
not make much use of  
the advanced graphics  
of the PC.*

aircraft, to fly the plane.

Of course, this is not the first computer program to be hobbled by the lack of decent instructions. However, be advised that you'll have to solo your first time out.

Is *Flight Command* realistic? Not really. But then again, neither is *Flight Simulator*. In both pieces of software, you're



still very aware that you are at a keyboard rather than a control panel. *Flight Simulator* is closer to an arcade game. Its exciting, though still sketchy, visuals are a real

***T*** HIS IS NOT  
the first computer  
program to be hobbled  
by the lack of decent  
instructions.

strongpoint. Its display of instruments is more impressive than those offered by *Flight Command* because you watch rotating gauges and artificial horizons rather than mere numbers.

By comparison, *Flight Command* looks more like a text adventure than a graphics game, although this is not necessarily bad. I found it slightly more challenging to "fly" *Flight Command*, but it was not as much fun as its popular competitor.

**Air Traffic Controller**

Avant-Garde Creations  
P.O. Box 30160  
Eugene, Oregon 97404  
(503) 345-3043

**List Price:** \$29.95

**Requires:** 64K, PC-DOS, color/graphics or monochrome adapter.

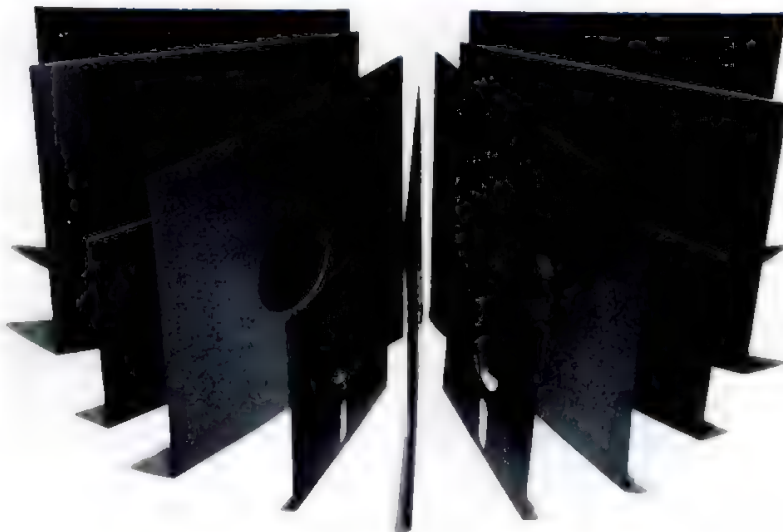
**CIRCLE 558 ON READER SERVICE CARD**

With all the 747s, Concorde, Cessnas, and military aircraft zooming around the sky at the hands of computer owners who have trouble piloting the family Chevrolet through a shopping center parking lot, there is bound to be need for a good air traffic controller.

Well, like *Flight Command*, *Air Traffic Controller* from Avant-Garde Creations comes close, but it is no air champion. This adaptation of a popular Apple II game presents a small rectangle and a wind indicator on your screen. Numbers and symbols representing aircraft move around in the "sky." Your job is to keep the planes from colliding in midair, stack them up in a logical fashion for landing,

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**CIRCLE 504 ON READER SERVICE CARD**



keep an eye on fuel status, and bring them in to a neat, upwind landing.

The location of the plane is represented by something like 5 <, 1150, E, which means that Plane 5 is on a level (<) course at 1,150 feet, heading east. If another plane were moving straight at 6°, 1200,S, you would have no cause for alarm, since this means that it is climbing and is already at a higher altitude.

It's fairly simple to keep the various planes separated; you communicate with the planes through simulated radio conversations. To tell Plane 6 to descend, for example, you would type 6D, and the arrow would change direction. The program assumes that all commands not preceded by a number refer to the plane last communicated with, a convenience when you're on final approach in a crosswind.

### Crash Landings

I was not too successful in performing landings, however. My planes seemed to consistently fall short or veer off the runway at the moment of touchdown. I was

not helped by the IBM PC instructions for Air Traffic Controller, either. They consisted of a single printed page inserted in the Apple II package—hardly adequate,

***T*****HIS IS AN  
interesting piece of  
programming that has  
been marred by a lack of  
concern for novice  
users.**

even when supplemented by reading the Apple II instructions (which involve a different set of commands) or by reading a few pages of on-screen instructions. Once again, this is an interesting piece of programming that has been marred by a lack of concern for novice users.

Furthermore, this program makes no use of the graphics and sound capabilities of the PC. At the very least, the program could have presented a circular radar screen with a sweep arm. At most, it could have been a worthy companion to *Flight Simulator*. Instead, it's an interesting relic of early computer games that have come creaking onto the IBM PC screen.

Ultralight Command  
Fast-N-Fun Video  
1974 E. Sandpiper Drive  
Tempe, Arizona  
(800) 543-3000, Operator 810

List Price: \$39.95

Requires: 64K RAM, disk drive, color/graphics board, color or monochrome monitor or television, joysticks optional.

CIRCLE 557 ON READER SERVICE CARD

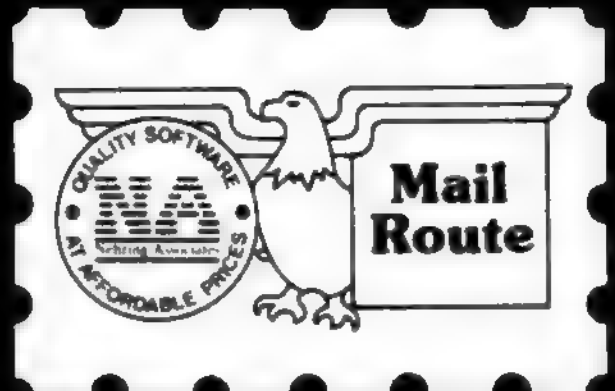
The next game involves military aircraft; in this case, something called an "ultra-

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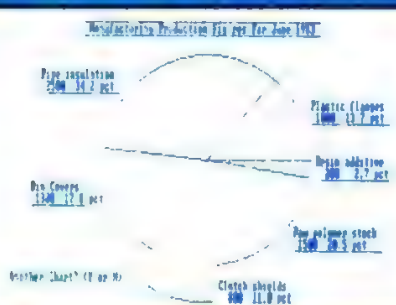
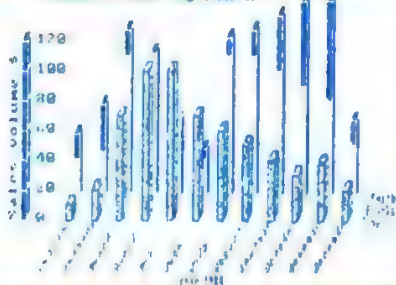
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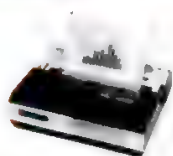


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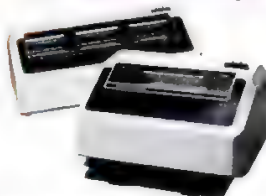


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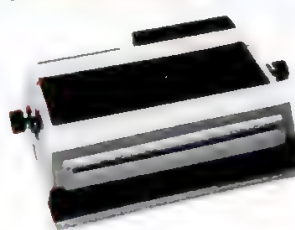
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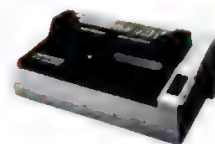


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light," which is "half push-prop airplane, half hanglider" and is equipped with both a radar screen and of course the obligatory laser gun.

Your mission, should you decide to accept it, is to participate in a strange melange of good guys and bad guys. Your attackers are unidentified enemies in helicopters, jet planes, alien pods, and flying saucers. The beneficiaries of your defense are two little men in a tiny open motorboat. Clearly, ours is not to question why.

Basically, *Ultralight Command* is yet another shoot-em-up, reminiscent of the highly popular Apple II game *Choplifter* in its display and shooting tactics, with the inclusion of "actual voice transmissions" from mission control.

You are given the choice of running the game from either the keyboard or from a joystick, and you may select from three levels of difficulty. The keyboard commands, which may be reset, use the cursor keys. There is no pause during the course of the game, however. At the start, you are queried about your monitor: RGB color,

color or monochrome television, or monitor wired to the PC color/graphics adapter. The program is also copy-protected.

#### Not Much Action

The action of the game involves moving the "ultralight" back and forth and up and down on the screen, firing the laser

---

***B***ASICALLY,  
*Ultralight Command* is  
yet another shoot-em-  
up, reminiscent of the  
highly popular Apple II  
game *Choplifter*.

---

when one of the unusual assortment of enemy craft is within range. One interesting effect involves a pair of radar screens

at the bottom of the display, one shows the oncoming traffic ahead of you, the other shows the traffic behind you. The program gives you a warning beep whenever a target appears.

The play action was quite ordinary; it was possible to fly along peaceably by either staying up at the top of the screen (perhaps the aliens are afraid of heights?) or by reversing the direction of the flight, which usually puts your enemies into reverse flight.

And then there is the matter of the voice transmissions that emit from the PC's built-in speaker from time to time; it took a while to figure out that the announcements were along the lines of "Attack Wave Four!" Instead, they sounded more like the almost totally unintelligible squawks of a loudspeaker on a crowded New York City subway at rush hour.

Nice try, Fast-N-Fun Video. I'd give this game some credit for innovation, even if it is the third member of our trilogy of flying games to meander off course after a promising takeoff. /PC

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*Recording engineers have traditionally relied on intuition or trial-and-error to select and position microphones in the studio. Programs for the PC can make a science of this.*

# "Testing 1 2 3" With The PC

Not too many years ago, the recording industry was a reasonably safe hideout for those technical types whose inclinations were more sonic than scientific. In fact, the Engineer part of the title, "Recording Engineer," rarely had anything to do with university credentials. Most of us got our education hanging around the studio—and just as well, too. Most university engi-

neering programs had not yet conceded that there might be intelligence existing below 20,000 Hz (or, at the time, cycles-per-second).

Needless to say, all of this has changed drastically, and it's no longer enough for





the recording engineer to boast a good ear and a pleasing manner. It all began when stereo replaced mono recording. This was followed in short order by recording on three, four, and eight tracks, and now the 32 or more separate channels of multi-track tape recorders.

As high technology found its way into the studio, the recording engineer's little book of jargon soon gave way to a full-size lexicon with entries such as "over-dubbing," "synchronization," "interfacing," "interlocking." The old-timers got very

uncomfortable indeed. In no time at all, a big-buck multi-track audio/video recording production got to be more than one person could comfortably handle. It felt a bit like trying to fly a 747 with a single-engine license.

In little more than no time at all, computers started showing up in the recording studio to help keep things manageable. The engineer, who had been comfortable enough doing musical balancing acts with the familiar slide faders, now had to contend with keyboards and CRT displays, and in some cases, even color graphics!

The industry has more or less come to terms with the new technology, and some of us are even getting comfortable with a new group of words beginning with "micro." As the once-fearsome computer becomes more and more familiar, some recording engineers have begun exploring its use in applications that go beyond just running the equipment.

For example, consider the fine art of microphone placement. There are no rules here, and there probably never will be.

The proper microphone correctly placed is based on nothing more than what works best under the circumstances of the moment. In any recording session, different circumstances will suggest different

***THE PROPER  
microphone correctly  
placed is based on  
nothing more than what  
works best under the  
circumstances of the  
moment.***

microphones. Still, when it comes to microphone placement, it often helps to know "what happens if ..."—not a question for SuperCalc.

Specifically, you must take into account that each microphone has its own characteristics. Its frequency response helps the engineer decide which microphone to use on which instrument. On a multi-track production, super-flat response is rarely preferred. Rather, the engineer seeks a microphone with a "personality" that compliments each musical instrument. An important part of that personality is the microphone's polar response; that is, its sensitivity to sounds arriving from various directions.

More often than not, each instrument being recorded is directly in front of its own microphone, with other instruments located some distance away. This gives the engineer more control over the musical balance. (Discussion of the artistic merit of this technique is fortunately beyond the scope of this little opus.)

In the quest for more and more acoustic isolation between instruments, engineers may seek out a highly-directional microphone—one that favors sounds arriving from directly in front of it (that is, on-axis) and which greatly attenuates sounds arriving from elsewhere (off-axis). Of course, attenuation is mostly a matter of degree (literally, in terms we shall soon see), so there is really no such thing as a microphone which is totally unresponsive to off-axis sound.



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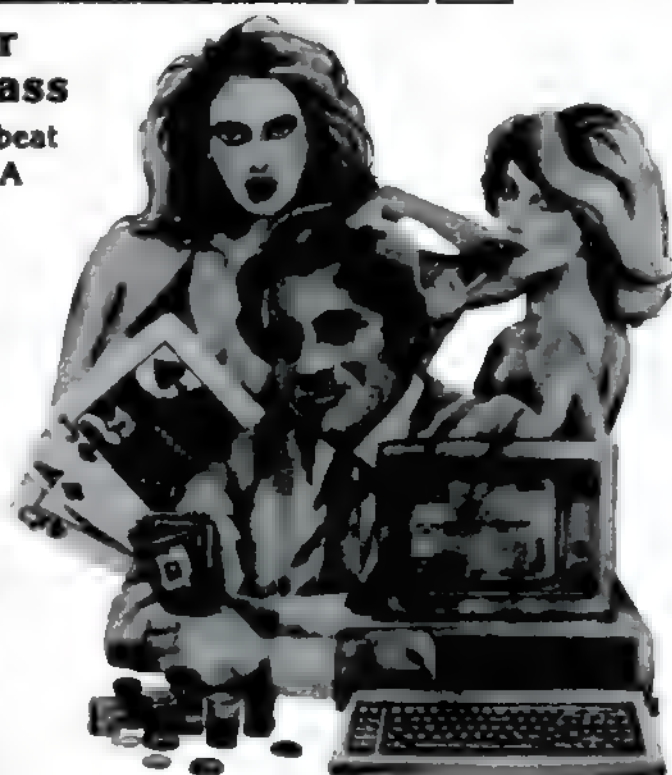
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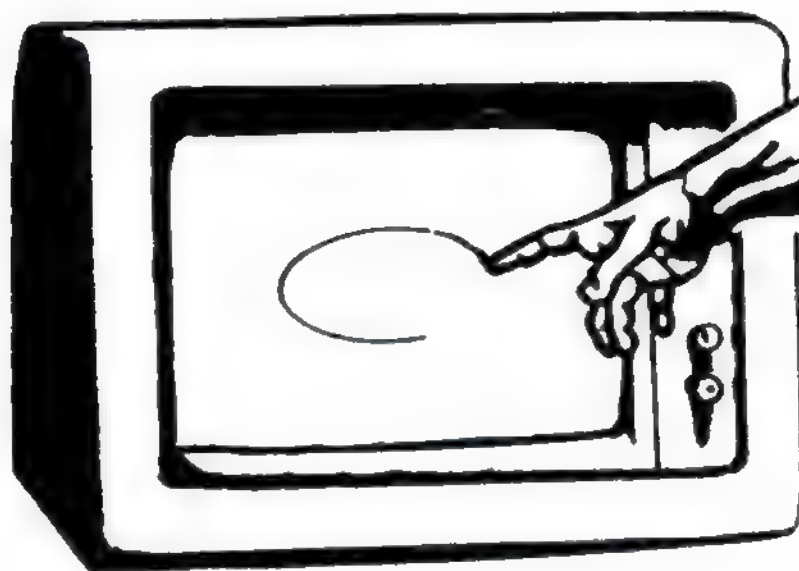
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To further complicate matters, when the outputs of any two (or more) microphones are combined, their individual polar responses interact. Under certain conditions, two highly-directional microphones may in effect become one microphone which is not directional at all. Under the worst of conditions, a recording of an on-the-street interview may wind up with more street than interview.

To help the engineer select the right microphone, specification sheets generally include a graph of polar response, Figure 1. The three examples in Figure 1 illustrate ideal bi-, uni-, and nondirectional responses, and in each case the microphone's attenuation at any angle may be read directly from the graph.

**WHEN IT**  
comes to microphone  
placement, it often helps  
to know "what happens  
if ..."

The directional sensitivity of these microphones, or any others, may be plotted using the general polar equation,  $S = A + B\cos\Theta$ .  $A$  is the measure of nondirectional sensitivity;  $B$  is the measure of directional sensitivity; and  $\Theta$  is the angle

from which sound arrives. This information may fascinate mathematicians, but it doesn't interest most recording engineers, who prefer to get on with the session and never mind the number-crunching.

### Meanwhile, What If . . . ?

However, some questions do come up. What if the signals from two uni-directional microphones are combined? What if the polarity of one of these microphones is reversed? Since bi-directional microphones are not commonly found in many studios, is it possible to create one in a pinch by combining two uni's? Given two microphones with totally different polar characteristics, is it practical—or even possible—to make a really satisfactory stereo recording?

For most working recording engineers, the answer to this kind of questioning is quite often something like, "... well, uh ...". However, a little intuitive knowledge about what will happen when two microphone outputs are combined could go a long way toward helping any recordist with microphone selection and placement. Unfortunately, mathematical and/or graphical analysis of polar patterns is not nearly as much fun as recording, although it can certainly be as time-consuming.

### Enter the PC

Here's an easy job for the PC. With a little bit of BASIC, it's possible to find out just what will happen when any two microphone outputs are combined. After

**THE ENGINEER**  
seeks a microphone with  
a "personality" that  
compliments each  
musical instrument.

trying out just a few combinations, many engineers (amateur as well as pro) may find that their recording technique has improved greatly.

But first, back to that equation,  $S = A + B\cos\Theta$ , and a few basic (lower case) rules of the road.  $A + B$  is always equal to 1, and  $\Theta$  indicates the angle of the sound source. Since  $\cos 0 = 1$ , when the sound arrives from straight ahead, for any microphone, it's true that  $S = A + B(1) = 1$ , regardless of its sensitivity. In other words, we assume that all microphones are equally sensitive to sounds arriving on-axis. If the overall system gain is turned up or down, the sensitivity changes accordingly.

Going a step further, the specific values for  $A$  and  $B$  give an indication of the microphone's directional sensitivity. The

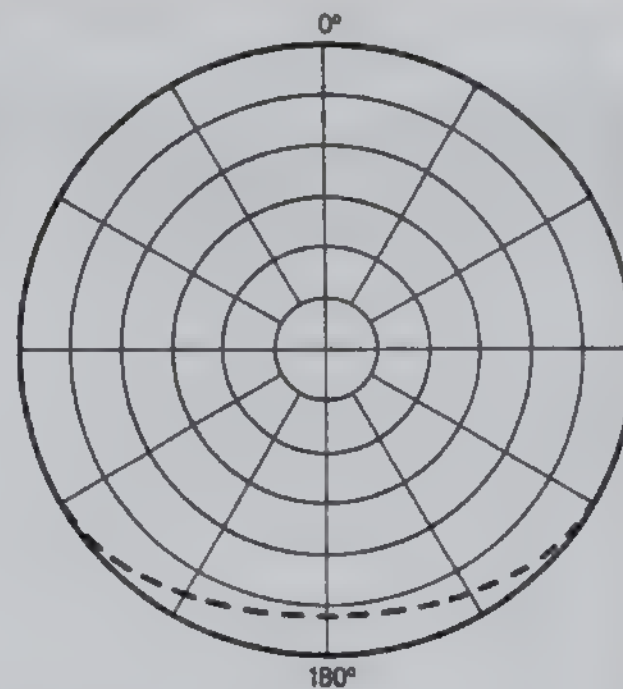
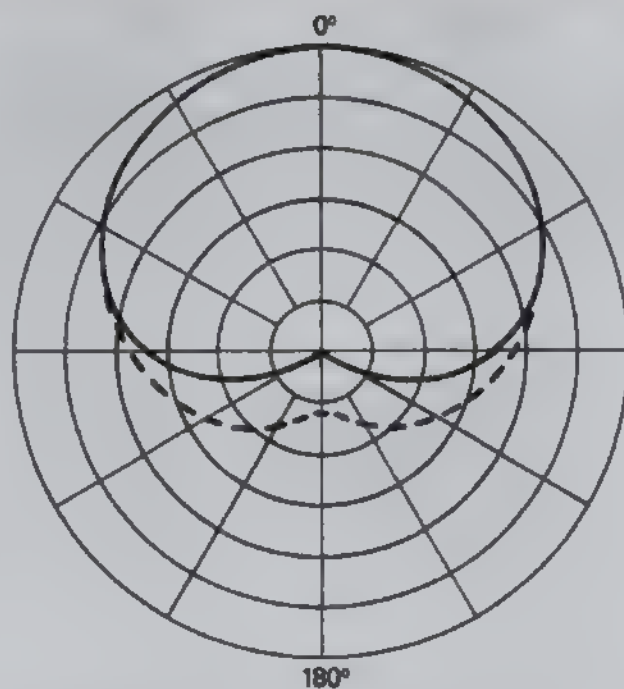
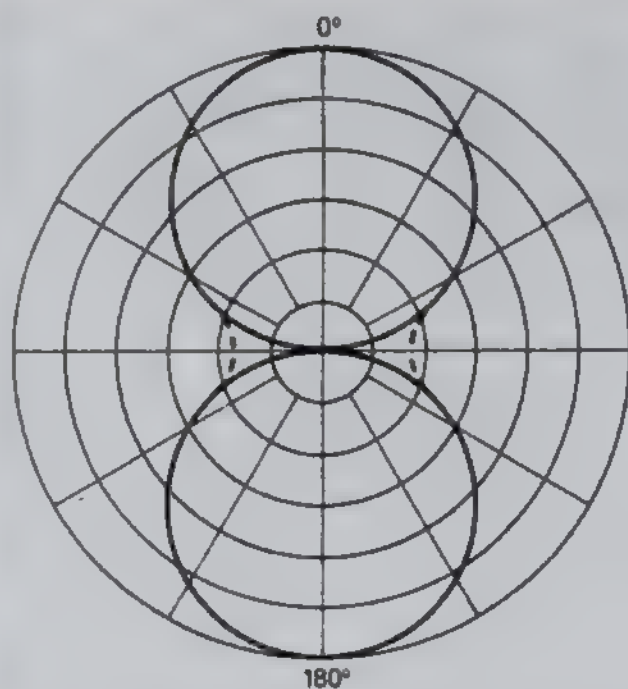


Figure 1: Examples of three typical microphone polar response patterns: bi-directional (left), uni-directional (middle), and non-directional (right). The microphones face toward 0 degrees at the top of the diagrams. The solid lines indicate the ideal patterns, while the dashed lines represent actual values of some typical commercially-available microphones.



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```

240 PRINT "Calculating polar patterns"
250 FOR N = 1 TO 2
260   FOR K = 0 TO 72
270     R = .01745 * (5 * K - AN(N))
280     R(N,K) = SN(N) * (A(N) + B(N) * COS(R))
290     TH(K) = 8.724999E-02 * K
300     X(N,K) = ABS(R(N,K)) * COS(TH(K))
310     Y(N,K) = ABS(R(N,K)) * SIN(TH(K))
320     PRINT "#";
330   NEXT K
340 NEXT N
350 PRINT
360 PRINT "Calculating the SUM pattern"
370 FOR K = 0 TO 72
380   PRINT "+ ";
390   FS = R(1,K) + R(2,K)
400   X(3,K) = ABS(FS) * COS(TH(K))
410   Y(3,K) = ABS(FS) * SIN(TH(K))
420 NEXT K
430 PRINT
440 PRINT "Calculating the DIFFERENCE pattern"
450 FOR K = 0 TO 72
460   PRINT "- ";
470   FD = R(1,K) - R(2,K)
480   X(4,K) = ABS(FD) * COS(TH(K))
490   Y(4,K) = ABS(FD) * SIN(TH(K))
500 NEXT K

```

Figure 2: This BASIC subroutine will calculate the X and Y coordinates for two microphones' polar patterns, and their sum and difference. You must first enter the values for A (non-directional sensitivity), B (directional sensitivity), and AN (the angle at which each of the two microphones is oriented).



**T**HE DIRECTIONAL sensitivity of microphones may be plotted using the general polar equation,  

$$S = A + B \cos \Theta.$$

greater the value of B, the more sensitive the microphone is to the direction from which the sound is arriving. When  $B = 0$ , then  $B \cos \Theta$  will always be zero, regardless of the value of  $\Theta$ . In other words, the angle of the arriving sound is of no significance, and the microphone's sensitivity is always equal to 1. The microphone is truly nondirectional. When  $B = 1$ , sensitivity is strictly dependent on the angle  $\Theta$ , and the polar response is bi-directional. When values are midway between these extremes ( $A = 0.5$ ,  $B = 0.5$ ) the microphone's response is uni-directional.

Now then, what happens when any two microphone outputs are combined? For the moment, let's assume the microphones are placed back-to-back, so that a sound arriving at the front of one (0 degrees) simultaneously reaches the rear of the other one (180 degrees). For that matter, a sound arriving at microphone 1 from any angle  $\Theta$  arrives at microphone 2 at an angle of  $\Theta + 180$ . The equations may be added as follows:

$$\begin{aligned} &\text{Microphone 1} + \text{Microphone 2} \\ &[A + B \cos(\Theta)] + [A + B \cos(\Theta + 180)] \\ &\text{Sum} = 2A + B - B = 2A \end{aligned}$$

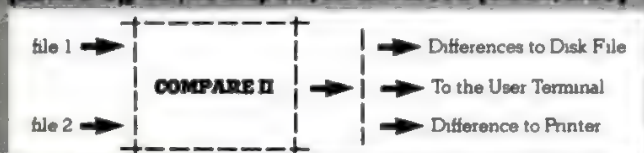
In other words, the values for A and B don't really matter; when the microphones are combined, the cosine term drops out and we are left with a nondirectional polar response. So we may conclude that combining any two identical microphones back to back will always give us an omni-directional pattern.

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microphones has its polarity reversed, we must subtract the outputs, and get:

Microphone 1 - Microphone 2

$[A + B\cos(\Theta)] - [A + B\cos(\Theta + 180)]$

Difference =  $2B\cos(\Theta)$

The plot thickens. As the angle between the microphones is varied, the cosine term does not entirely drop out during addition, and so the combined pattern contains some amount of directionality. But when there is a polarity reversal, the A term always drops out, so that combination is always bi-directional.

Once this point is clear, the engineer will realize that a bi-directional microphone can be quickly whipped up, just by combing any two uni-directional microphones and setting up one of them with a polarity reversal. Without the polarity reversal, the same two microphones would deliver a nondirectional response; this would explain the sudden disappearance of either microphone's highly-directional characteristic.

### Stereo Recording

A well-proven stereo recording technique is to use one uni-directional microphone and a bi-directional microphone, with the latter oriented at 90 degrees to the sound source. When the outputs are combined, the result is a signal favoring the left side of the sound source. When the same outputs are combined, but with a polarity reversal in the bi-directional output, the result is a right-oriented signal. With one of these combinations feeding the left speaker, and the other going to the right, we hear an excellent stereo rendition of the original sound source. As the bi-directional output is varied from off to

on, the reproduced output varies from mono to very-wide-angle stereo.

The mathematics to prove this can get a bit tedious, so it's best to turn the task over to the PC. A reasonably simple program will handle the chore nicely.

### Microphones Meet The Micros

Figure 2 presents a short BASIC subroutine that will calculate the X and Y coordinates of any two microphone polar patterns, and then calculate the coordinates for the sum and difference patterns. The FOR N = 1 TO 2 loop permits a set of calculations for two patterns. For each set, the K loop steps the calculations through 72 increments, of 5 degrees each.

In line 270, AN(N) is the angle at which the microphone is oriented, and R is the incremented angle, expressed in radians.

Line 280 calculates the sensitivity R(N,K) of each microphone at each 5-degree increment. SN(N) is the on-axis sensitivity of the microphone. For the moment this can be set equal to 1 for both microphones. Next, the X and Y coordinates are calculated by multiplying the absolute sensitivity by the cosine and sine of the angle.

The PRINT "#" statement in line 320 could be changed to display the X and Y

coordinates as they are being calculated. Since these calculations aren't very interesting to watch, the # symbols that appear simply show you the program is running.

The loop to calculate the sum pattern, beginning on line 370, does much the same routine, except that the sensitivities of both microphones R(1,K) and R(2,K) are added in line 390, and the sum coordinates X(3,K) and Y(3,K) are calculated.

Finally, the loop beginning on line 450 does the same thing for the difference coordinates. In both these loops, the PRINT "+" and PRINT "-" just let you know the program is operating.

### Drawing the Conclusions

Figure 3 presents the BASIC instructions that will draw the polar responses for the two microphones as well as the sum and difference responses.

Since the center of the medium-resolution screen is at 160, 100, these values are combined with each X and Y coordinate in lines 540 and 560. And in order to draw a suitably-proportioned display, each coordinate is multiplied by a scaling factor of 1 and then by 100. Actually, the X coordinate may be multiplied by about 110, in order to draw a better-proportioned circle. A little trial-and-error may be required,

```

520   FOR N = 1 TO 4
530     FOR K = 0 TO 72
540       XX(K) = 160 + SC * 108 * (X(N,K))
550       IF ABS(X(N,K)) > HS THEN HS = ABS(X(N,K))
560       YY(K) = 100 - SC * 100 * (Y(N,K))
570       IF ABS(Y(N,K)) > VS THEN VS = ABS(Y(N,K))
580       IF K = 0 THEN GOTO 610
590       IF N = 4 THEN PSET(XX(K), YY(K)):GOTO 610
600       LINE (XX(K), YY(K)) - (XX(K-1),YY(K-1)), N
610     NEXT K
620   NEXT N

```

Figure 3: A subroutine to draw the four polar response patterns on a medium-resolution display, using the values calculated by the program in Figure 2.

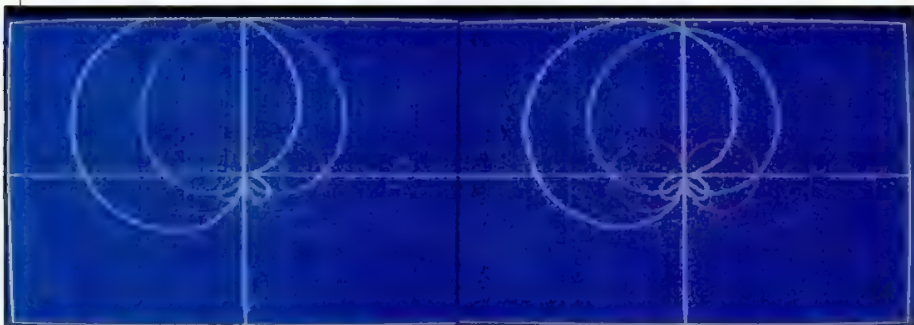


Figure 4: A display illustrating polar response patterns for the Mid-Side (M-S) recording technique. The outputs of a uni-directional (blue) and a bi-directional (red) microphone can be combined to yield the sum (solid white) and difference (dotted white) patterns. The display on the right has been rescaled to fit within the screen's boundary.





```

2020 FOR X = 1 TO 2
2030   SA(X) = A(X) * SN(X)
2040   SB(X) = B(X) * SN(X)
2050 NEXT X
2060 D = AN(1) - AN(2)
2070 DD = 1.745329E-02 * D
2080 CLS
2090 PRINT "When the following two microphones;"
2100 PRINT
2110 PRINT "[Blue pattern] M1 = ", USING "%.000", SA(1);
2120 PRINT " + ", USING "%.000", SB(1);
2130 PRINT "cos", CHR$(237); MID$(G$(1), 22, 35);
2140 PRINT ", and"
2150 PRINT "[Red pattern] M2 = ", USING "%.000", SA(2);
2160 PRINT " + ", USING "%.000", SB(2);
2170 PRINT "cos", CHR$(237); MID$(G$(2), 22, 35)
2180 PRINT
2190 PRINT "are combined, at an angle of"
2200 PRINT
2210 PRINT TAB(10) D; " degrees, the results are;"
2220 PRINT "-----"
2230 S$ = "[Solid line      =      SUM:]"
2240 FOR X = 1 TO 2
2250   PRINT S$
2260   PRINT
2270   IF SB(1) = 0 OR SB(2) = 0 THEN DEN = 1:GOTO 2290
2280   DEN = SB(1)/SB(2)
2290   RA = ATN(SIN(DD)/DEN)
2300   A = SA(1) + SA(2)
2310   B = SB(1) * COS(RA) + SB(2) * COS(-DD + RA)
2320   C = ABS(A) + ABS(B)
2330   RC = 1 / C
2340   PRINT "Polar equation = ";
2350   PRINT TAB(20) USING "%.000", A;
2360   PRINT " + ", USING "%.000", B;
2370   PRINT "cos", CHR$(237)
2380   PRINT "Normalized eq. = ";
2390   AN = A * RC
2400   BN = B * RC
2410   PRINT TAB(20) USING "%.000", AN;
2420   PRINT " + ", USING "%.000", BN;
2430   PRINT "cos", CHR$(237)
2440   PRINT "Resultant angle = ";
2450   DG = RA/1.745329E-02
2460   PRINT TAB(20) INT(DG * 100 + .5)/100; " degrees."
2470   IF A < 0 OR B < 0 THEN PRINT " - - (note polarity reversal) - - "
2480   S$ = "[Dotted line = DIFFERENCE]"
2490   SA(2) = -SA(2)
2500   SB(2) = -SB(2)
2510   PRINT
2520 NEXT X

```

Figure 5: A BASIC subroutine to calculate the sum and difference patterns for two microphones that displays the results numerically.

since the optimum value will depend on the screen being used. You can experiment by drawing a bi-directional pattern and adjusting the scaling factor to your screen size.

### Scaling the Display

Depending on the values chosen for A and B, the sensitivities of the micro-

**G**IVEN TWO microphones with totally different polar characteristics, is it possible to make a really satisfactory stereo recording?

phones, and the angle between them, the sum and/or difference displays may go off-screen. A new scaling factor (SC) can be calculated as a correction, if this happens, by the following lines:

HS = 1/HS : VS = 1/VS  
 SC = HS  
 IF VS < HS THEN SC = VS

The scaling factor is based on values for the horizontal and vertical scales (HS and VS) which had been continuously up-

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PC MAGAZINE 472 JUNE 1983





When the following two microphones;

M1 = .375 + .625 cosθ (blue pattern), and  
M2 = .375 + .625 cosθ (red pattern)

are combined, at an angle of

90 degrees, the results are;

SUM: (solid line)

Polar equation =  $0.750 + 0.884\cos\theta$   
Normalized eq. =  $0.469 + 0.541\cos\theta$   
Resultant angle = 45 degrees.

DIFFERENCE: (dotted line)

Polar equation =  $0.000 + 0.884\cos\theta$   
Normalized eq. =  $0.000 + 1.000\cos\theta$   
Resultant angle = -45 degrees.

Figure 6: A display summarizing the calculations performed by the subroutine in Figure 5.

dated in Lines 550 and 570. If the display is to be redrawn, this SC value is substituted for the previous value of SC = 1 in Lines 540 and 560.

Figure 4 illustrates the Mid-Side (M-S) microphone combination. The blue pattern is the uni-directional microphone at 0 degrees, and the red pattern shows the bi-directional pattern at 90 degrees. Sum and difference patterns are shown by the solid and dotted-line curves. Since the top of the display is slightly off-screen, the display may be rescaled and redrawn, as seen in the second illustration of Figure 4.

### Just the Math, Please

If color graphics capabilities are not available, Figure 5 lists a program segment that will simply calculate the resultant sum and difference polar patterns when any two microphones are combined. In lines 2110-2120 and 2150-2160, SA and SB are the values of A and B multiplied by the microphone's sensitivity.

Depending on the sensitivities chosen, the actual microphone selected, and the angle between them, the sum of A + B in each of the resultant polar patterns will

probably not be equal to 1. Therefore, Lines 2270 to 2420 convert these values to a normalized (i.e.,  $A + B = 1$ ) equation, making it easier—in the absence of a graphic display—to visualize the approximate shape of the resultant patterns. Again, remember that the greater the value of B, the more sensitive the pattern is to directional information.

### Entering the Data

A simple FOR N = 1 TO 2 loop can be written to enter values for the parameters of each microphone. First enter A(N), and then calculate  $B(N) = 1 - A(N)$ . To keep things simple (at first), each microphone's sensitivity, SN(N) can be set equal to 1. As for the angle AN(N), 0 degrees is considered as pointing straight ahead, and the orientation rotates counter-clockwise as the angle is increased.

Most microphone specification sheets illustrate 0 degrees as pointing straight up, a practice that's followed in the polar patterns of Figure 1. However, mathematicians (and computers) usually draw 0

degrees as a horizontal line moving from left to right. Therefore, to make the graphics display agree with standard microphone diagram practice, add this program line:  $AN(N) = AN(N) + 90$ . This will get the 0-degree polar pattern pointing in the right (oops, that should be up) direction.

Once the calculations are done, and the displays have been drawn in the proper scale, the results are summarized on the black and white screen, as in Figure 6.

What happens when you combine the outputs of two uni-directional microphones, one of which has a polarity reversal? And, what if . . . ?

If you're a recordist with a PC in the studio, such questions can be answered quickly by using this tool. Better yet, you can play *Flight Simulator* while waiting for the guitars to tune up! /PC

John M. Woram, of Woram Audio Associates in Rockville Centre, New York, is a consultant specializing in studio system engineering, design, and installation, and a freelance studio recordist.

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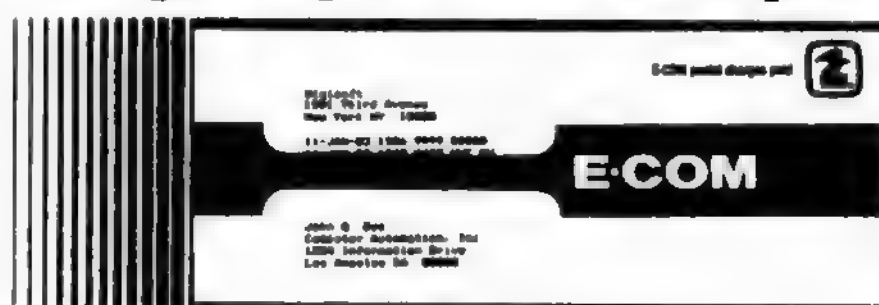
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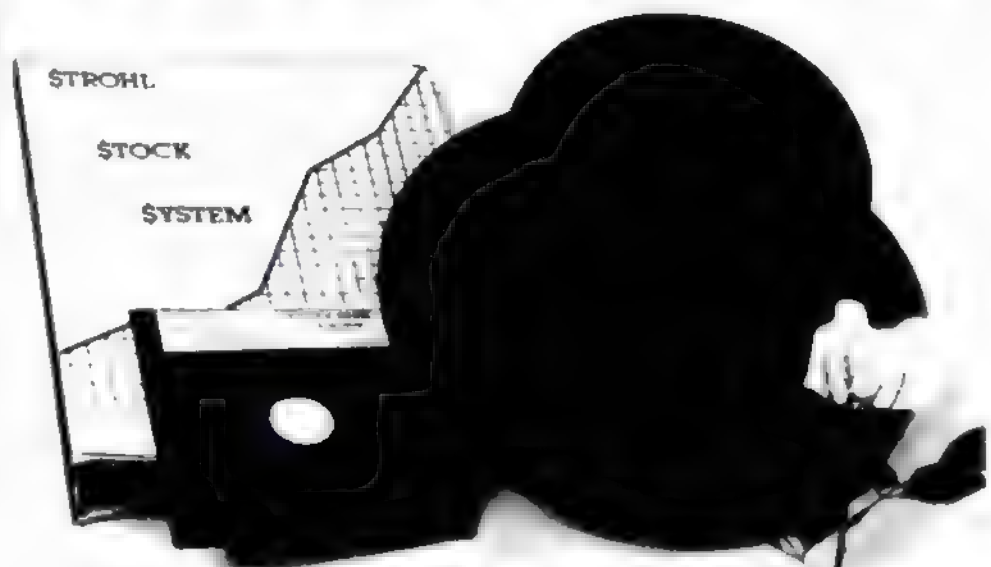
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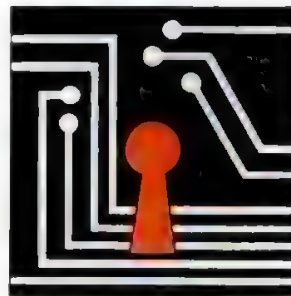
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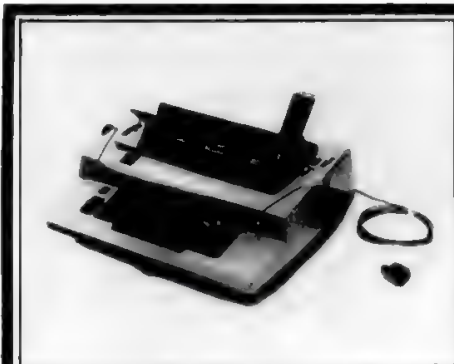
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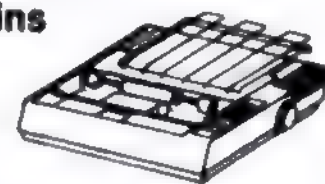
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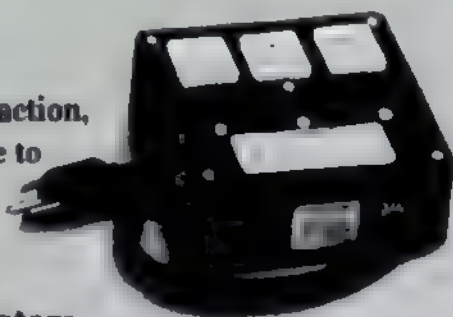
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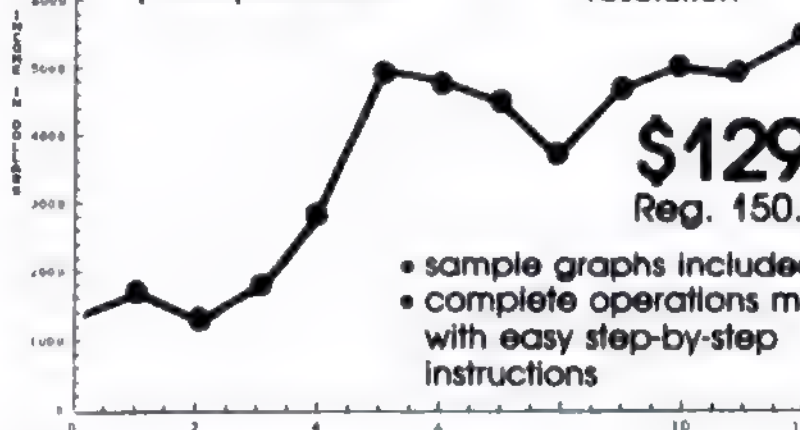
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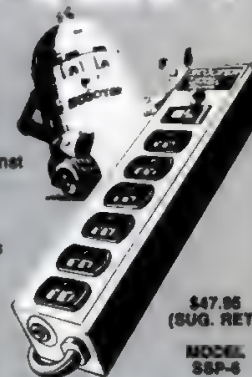
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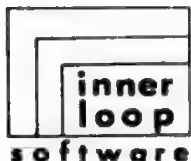


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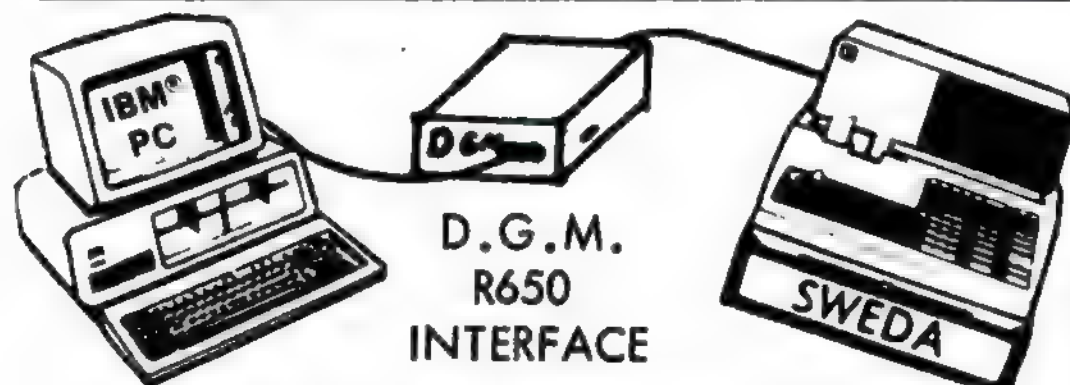
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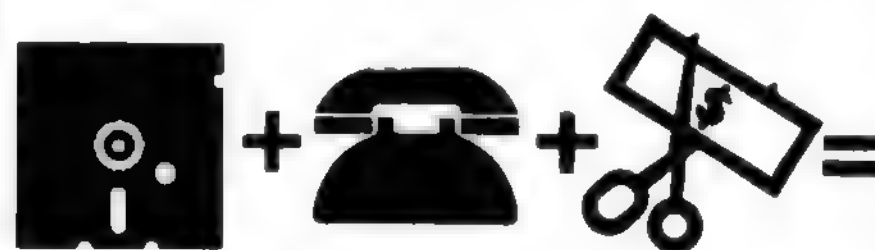
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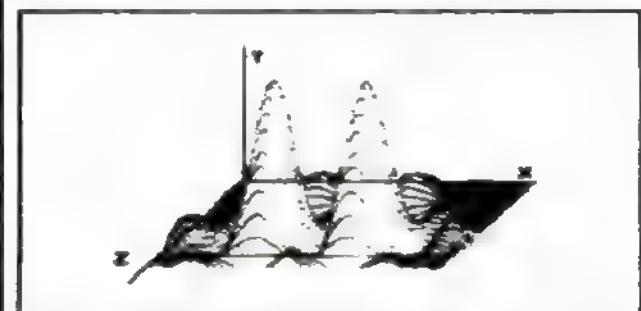
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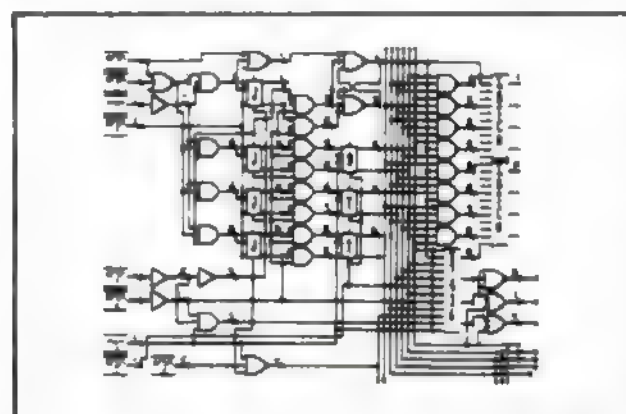
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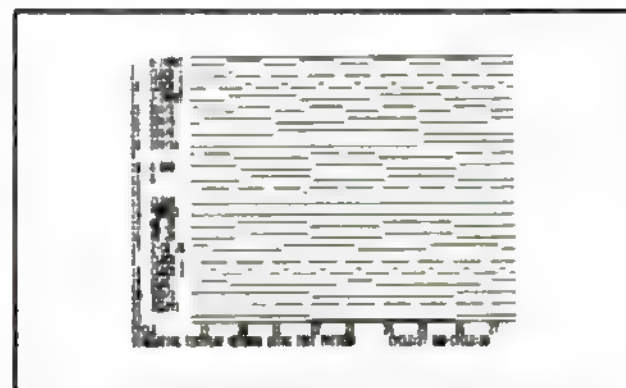
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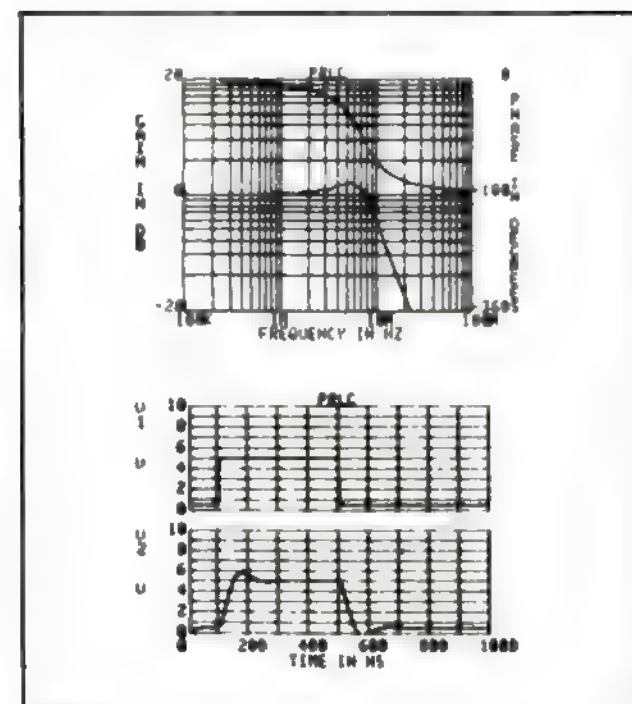
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# Computing Down On The Farm

If the computer industry believed the bleak predictions for farming in the next few years, the agricultural computer business would be abandoned as quickly as an outdoor lemonade stand in the middle of a blizzard. But this hasn't happened. Manufacturers that deal in farm related products are selling more lemonade than ever, so to speak.

What gives a market that looks so weak its hidden strength? Two things. First, numbers; second, attitudes. There are a lot of farmers, and in the United States, farmers are innovators. They are students of efficiency, in short, an interested and receptive market. The same economic conditions that make farming difficult make the computer more attractive.

Look at the numbers. Agricultural Computing: the Doane Western Newsletter for Computer Users in Agriculture, reported in December 1982 the results of a recent survey by the University of Illinois. 3 percent of all farmers currently own computers. Within 6 years, the survey suggests the U.S. [farm] market may be upwards of 60,000 computers. Specialists with the Illinois Farm Bureau estimate that the market within that state alone may exceed \$140 million during the next few years. That's more than was spent on

trucks by Illinois farmers in 1980.

In the Yakima Valley and the Columbia Basin of the state of Washington, almost every dealer from Yakima to Wenatchee is gearing up to support the farm market.

One indication of the potential of the farm computer market comes from IBM. It has enlisted Valmont, the leading manufacturer of center pivot irrigation sprinklers to distribute the IBM PC to the farm market. Radio Shack, another of the top three companies in farm computing, is supporting the farm information network, Agristar, and plans to publish a sourcebook devoted exclusively to agricultural software. Apple also recognizes the potential of the market and is providing full corporate support. When it comes to market analysis, the "big three" have looked carefully at the digital potential of the agribusiness; they saw that bushels and acres can translate into megabucks.

As for the depressed economics of farming, it is useful to look closely at who is hurting and why. Low commodity prices, high production costs, and steep interest rates have affected many farmers. The older, larger farms, however, are helped by the equity they have built up over the years in buildings, land, and equipment. Even though the highly publi-

cized foreclosures seem very foreboding, most of the farms will still receive their production and operating loans. But along with the dollars come admonishments from the PCA and from bank loan officers that farmers must manage their records better and keep a closer watch on their budgets. In short, Old MacDonald had better update his management strategy.

## The Digital Farmhand

Computers and farm accounting and recordkeeping software are the tools that most farmers choose over so-called "practical" equipment. When better management information is the top priority on the farm, a computer system often wins out over a bigger four wheel drive tractor or a new wind machine as the next major investment in the five-year plan.

Computer systems are cost justified on even the smallest farms because they can be used for recreation and education as well as for the farm operation. Over the years, I have learned to make very few generalizations about people—especially farmers—but I will risk two. One, farmers like to fiddle with gadgets, and mechanical things, and two, education is a high priority for farm families. This explains why the computer is a very attractive item



for a farm household's budget.

### Grading the Farm Computers

Which computers are the local farmers now using in your area? What type of software fits your area's agricultural operations? Time spent talking to other farm computer users and county extension agents means satisfaction later. The rule that software development follows hardware sales holds true in the farm market as well as in any other. Since IBM, Apple, and Radio Shack are way out in front in terms of sales, obviously, far more agriculture software is made available for their products than for any others. The next sales group includes North Star, DEC, Xerox 820, and Altos computers. Further down on the farm sales charts are Hewlett Packard, Vector Graphics, and Commodore. Of course, surprising things can happen, but it will probably be a while before this lineup shows any major changes in the farm computer market.

Where should the farmer shop for computers? The most critical variables after finding a selection of suitable software are hardware service and software support. On-site service and replacement equipment must be available. With these considerations in mind, you can determine how much distance should be between you and the computer dealer. A 50-mile radius, or one hour's driving time, is prob-

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***BEFORE YOU  
purchase a computer  
you must determine  
what you really need it  
for.***

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ably realistic for efficient hardware and software support. In more rural areas where shopping is normally a two-hour excursion, you can stretch the recommended distance, but past a certain point driving is no longer cost effective; the oil price war may not last forever.

### Fields for the Farm Computer

Before you purchase a computer you must determine what you really need it for: recordkeeping, farm accounting,

break even analysis, least cost rationing, depreciation schedules, piecework payroll problems, or herd records. You should also get acquainted with the farm information networks available to you, such as Agnet, Agristar, and Compuserve. When you evaluate a computer purchase, decide if you want a system that can perform market analysis or temperature monitoring, or a system that can analyze payment in kind programs. Are you interested in crop audits, cost accounting, farm equipment inventories and repair logs, commodity charting, field records, or herbicide selection? These are not just farm problems, they are also opportunities to use the computer to meet your real needs. You should understand these computer applications, or hire a consultant who does, in order to make the best possible choice of a computer system and the programs it runs.

Since each farming region is different from the next, you should be aware that a computer program designed for farms in the Midwest may not work for your area. Learn to distinguish your area's data processing problems. Is it labor intensive? Is it multiple crop oriented? Do you need enterprise accounting or will a simple single-entry check writing program do the job? This knowledge will help you select the appropriate software, which may help determine the hardware you will buy.

Farm software is becoming plentiful, but quality and local relevance still need to be evaluated carefully. Some of the better farm accounting packages include the Secretary of Agriculture, Agricultural Finance, the Homestead Farm Accounting Program, and the Financial Management Accounting System.

### Meeting the Rural Payroll

Finding a farm payroll program for labor intensive states such as California, Florida, and Washington is still a problem. You should find a local source that has dealt with the idiosyncrasies of your state's laws. We looked long and hard to find a payroll program to use in Washington state. We needed a package that handled piecework and hourly wage combinations as well as the advances and deductions that are often necessary for field laborers. Although we found a program, it was not customized, so we made use of a local programming resource.

The key to a successful farm system

purchase is matching relevant software and reasonable hardware costs to needs and available resources. Tenacity and trust are also critical. The decision to buy—and even the courage to buy—may take a while to come, but with proper support the risk is minimal.

### Sizing Up Farm Computers

How does the farm computer market

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***A COMPUTER  
program designed for  
farms in the Midwest  
may not work for your  
area.***

---

size up? Three major groups, accounting for most potential on-farm computer buyers, can be categorized according to size and need. The top criteria for computer system selection are the number of checks written, the number of W2 forms filed at the end of the year, and the number of cost accounting enterprises to be kept track of. These are not hard and fast criteria, but they will give you an idea of the computer systems ball park.

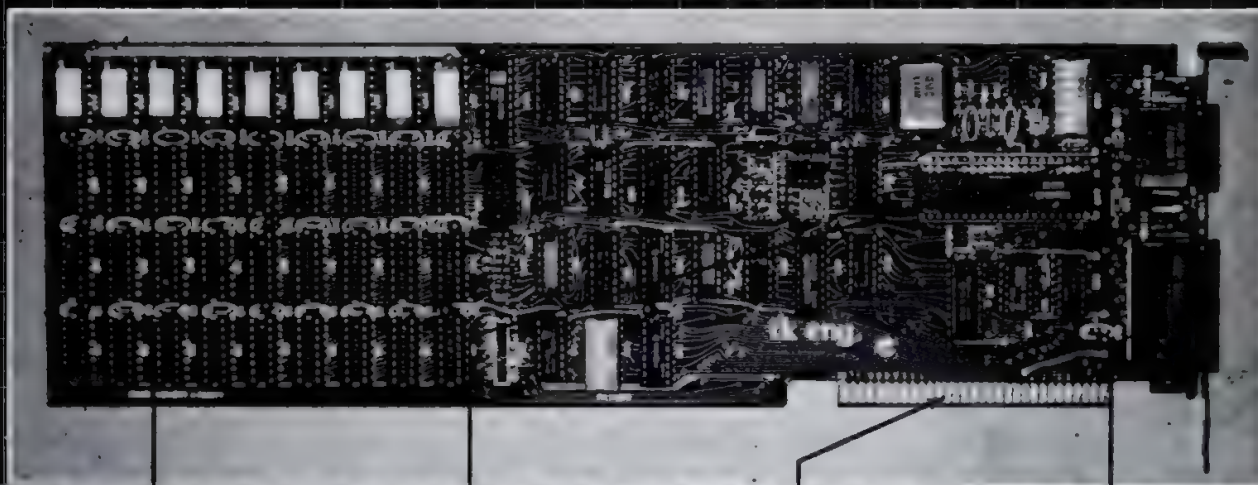
Small farms are characterized by the following criteria: they write under 500 checks a year, an average of two transactions per check, ten or fewer W2 forms at the end of the year, and no more than three cost accounting enterprises. Small farms can often be accommodated by a \$3,500 to \$4,000 computer system with an additional \$500 to \$1,000 invested in software. A single-entry check writing program is often adequate.

At the next level is the mid-sized farm, characterized by writing 1,000 to 2,000 checks a year with three to four transactions per check, 50 to 500 W2 forms (more in the labor intensive areas), and 20 to 30 cost accounting centers. Costs and minimum size hardware configurations tend to go up in this area. Users in this category seem to find that 64K RAM and two 320K floppy disks are the minimum storage requirements. Their printers need to be faster and the software costs increase. In this group, acquiring a 5- or



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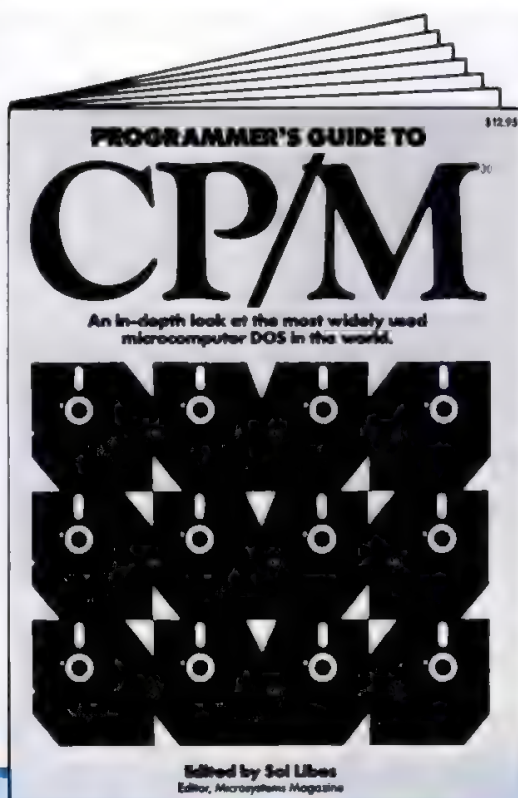
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CIRCLE 149 ON READER SERVICE CARD

PC MAGAZINE 496 JUNE 1983



*Perfect Calc puts out a spread of tasty features that may tempt users to bite off more data than this program can swallow.*

# Perfect Calc: Linked Spreadsheets With Flexible Formats

---

## Perfect Calc

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1-800-222-4222

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**Requires:** 64K, one disk drive.

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CIRCLE 631 ON READER SERVICE CARD

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The profits from VisiCalc, one of the all-time best-selling programs for microcomputers, have made Visicorp, the publisher, a major force in the microcomputer world. This has not escaped the notice of other software manufacturers. They, not surprisingly, are eager for a share of the vast electronic spreadsheet market.

Most manufacturers have chosen to

woo customers away from VisiCalc by offering a more refined, more feature-laden spreadsheet as an alternative. This race for a better spreadsheet has led to a number of programs which take the possibilities of VisiCalc well beyond the original bounds. Perfect Calc is one entrant into this "super spreadsheet" race.

Perfect Calc can be used for all the standard spreadsheet applications. Like VisiCalc, it allows a user to create and edit a large, interlinked, rectangular table of numbers and formulas in an intuitive manner. Each worksheet can have up to 52 columns and 255 rows. The range of applications to which this simple capability has been put is staggering, but the vast majority of owners use their spreadsheet simply to analyze or project financial data.

They model their electronic spreadsheet on an accountant's (paper) spreadsheet, which has financial categories as rows and time intervals (months, years) as columns. Additional rows might be sums or other calculated items.

Perfect Software, Inc., the company that brought you the respected Perfect Writer word-processor, chose to extend the basic spreadsheet in two directions. Perfect Calc offers refinements not found in the original VisiCalc, and it offers a powerful new capability as well.

Let's start with the refinements. Perhaps the nicest single feature of Perfect Calc is the manual, a 7-inch by 9-inch soft-cover book. (Amusingly enough, the publishing industry calls this sort of binding "perfectbound.") The paper has a pleasant



texture, without the harsh glare characteristic of the IBM manuals. The typography is crisp, the diagrams informative, the writing intelligent and clear.

The manual starts with an introduction to spreadsheets, leads the reader through a series of chapters and tutorials explaining how to use *Perfect Calc*, and ends with a discussion of several sample spreadsheets. The writer struck a good balance between reference and tutorial material. The manual is generic, meaning it isn't written specifically for the PC implementation of *Perfect Calc*. That would usually be considered a problem, but since this implementation in no way takes advantage of the PC's unique features, the generic manual is appropriate.

There are, however, a couple of anomalies. The discussion of memory management (described in an appendix) and occasional references to "alternate command sets" don't apply to the PC. And I never did figure out if this implementation supports what the manual calls a "function library." But overall, the manual is well executed, and very attractive.

*Perfect Calc* offers unusually extensive cell formatting capabilities. Almost every spreadsheet allows individual formatting of cells, but some require all columns to have the same width. *Perfect Calc* permits column widths to vary, to accommodate those wide "title" columns, while keeping

---

**P**ERFECT CALC  
permits column widths  
to vary, to  
accommodate those  
wide "title" columns,  
while keeping the others  
narrow.

---

the others narrow. Cells whose contents are labels can overflow into neighboring cells, provided the neighbor is empty. Again, this is handy for column titles, which might span two real columns. As a default, each cell displays the result or value of that cell, but you have the option

## EasyCalc: The Perfect Stepchild of Spreadsheets

*Budget-priced EasyCalc uses a less sophisticated approach to handle multiple spreadsheets—but it works.*

---

### EasyCalc

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(213) 257-2026

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Requires: 64K, one disk drive.

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CIRCLE 633 ON READER SERVICE CARD

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When I first received *EasyCalc*, I didn't take it very seriously. Sure, I glanced through the documentation and tried it out. But it's easy to become jaded, to look closely only at the high flying, heavily advertised products, and ignore the less well known companies.

I was more impressed after carefully reading the manual. *EasyCalc* has nearly all of the good features of *Perfect Calc*, including the advanced formatting, the numerous cursor control commands, and so on. However, it doesn't have the "regions" of *Perfect Calc*, nor can you "lock" cells. A more important difference is that *EasyCalc* can't handle multiple spreadsheets in memory at the same time. Instead, it allows you to make references to other spreadsheets stored on disk. Given the limited memory utilization, which it shares with *Perfect Calc* (and many other rivals), the *EasyCalc* approach actually

seems better.

The program also allows forward references: it deduces their existence and properly recalculates the spreadsheet. This, for example, means you can put column sums at the top of a column as well as at the bottom. Most spreadsheets don't allow the sum to appear at the top.

*EasyCalc* has a better user interface than *Perfect Calc*. The PgUp key and its friends do what I expect, and the rest of the cursor commands are easily remembered. The Help function is at least somewhat context sensitive. If the program is in a special mode, like command mode, then pressing the "?" key for help will provide information specific to that mode. Although not up to the standard of the *Perfect Calc* manual, which looks much better and is written in a more conversational style, the *EasyCalc* manual is quite clear and to the point.

*EasyCalc* looks suspiciously like a version of *Perfect Calc* tailored to the PC. And so it is; close inspection of the two manuals reveal that both *Perfect Calc* and *EasyCalc* were written by the same author.

And now for the bad news. *EasyCalc*, although in some ways better than *Perfect Calc*, still doesn't have the polish of other available spreadsheets. It has its share of bugs. I crashed this program, too. —H.H.

of displaying the cell's formula instead.

*Perfect Calc* can format the cell value in decimal, scientific, dollar, or graphic notation. Graphic notation provides a primitive plotting capability by substituting a scaled number of asterisks for each value. Cells can also be "locked;" that is, you can specify that they cannot be altered without first executing an "unlock." Templates—skeletal spreadsheets in which values are later entered—should be locked.

PC users with color monitors can choose which colors *Perfect Calc* will display by running a simple, menu-driven installation procedure.

The program has a rich assortment of

cursor movement controls. The typical spreadsheet program has only the basic four cursor controls (up, down, left, right). *Perfect Calc* adds page up, page down, page left, page right; also, commands to move the cursor to any edge of the spreadsheet: left edge, right edge, top, and bottom. You can also search for the next unlocked cell. Cursor control is further enhanced by a "repeat" command. To move left ten cells, simply move left once, then tell *Perfect Calc* to repeat the operation nine times. Nice.

*Perfect Calc*'s active spreadsheet can be divided into rectangular regions. Moving and copying regions from one part of the spreadsheet to another, printing a



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region, and limiting recalculation to a single region are functions you may find useful when working with large spreadsheets

**UNLIKE SOME OF its rivals, Perfect Calc has no sorting capability, nor can it handle simultaneous equations.**

that have several conceptually independent subparts.

Unlike some of its rivals, Perfect Calc has no sorting capability, nor can it handle simultaneous equations. If a worksheet contains forward references, it is up to you to recalculate the model since Perfect Calc won't handle this by itself.

Let's step back and think about the implications of these features. What is their impact on the spreadsheet user? Although the enhanced formatting commands give the printouts a touch more class, the thrust of these enhancements is to simply make it easier to get the job done. None of these refinements expands the usefulness of the program.

The one feature that gives Perfect Calc claim to the "super spreadsheet" category by really increasing its usefulness is its ability to link several spreadsheets together. Spreadsheet models are normally stored on disk. In order to do anything at all with them, you must first load them from the disk into the computer's main memory. Perfect Calc is no different—except that it can hold up to seven different spreadsheets in memory at once!

A formula in one spreadsheet can reference a value in a different in-memory spreadsheet. Perfect Calc lets you split the screen into two independent windows, allowing you to see two spreadsheets at once. There are commands to switch

spreadsheets in and out of window synchronize spreadsheets (so they i together), and so on. What good is all It provides the capability to accur build a hierarchy or network of mod

Consider the idea of "posting" as i accounting system. Individual entries subsidiary journal or ledger are total then, only the totals are entered in main ledger. That process is easily re

**PERFECT CALC can hold up to seven different spreadsheets i memory at once!**

sented by multiple, linked spreadsheet The many operating divisions of Meg corp are likewise candidates to be linke in this spreadsheet game.

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A simpler but equally useful application is defining several different spreadsheets whose sole purpose is to print a report. Each of these report formatters

## A 65K VISICALC model just won't fit into Perfect Calc.

might gather specific information from one main spreadsheet which contains all the data. For example, the main spreadsheet might be a ledger. One reporting spreadsheet could calculate and print the income statement, and another could calculate and print the balance statement.

Even better: the spreadsheets, once in memory, can be linked together so that a command to recalculate one will automatically recalculate all subsidiary spread-

sheets. Once the subsidiary spreadsheets are linked, they are automatically loaded by Perfect Calc whenever the main spreadsheet is loaded. In principle, this multiple spreadsheet feature, with its various options, is very attractive.

All of the linked spreadsheet models have to be in memory—not on disk—at the time of reference. This makes access faster, but also increases the likelihood of running out of memory. The prospect of running out of memory is, unfortunately, all too threatening, as Perfect Calc can handle no more than a total of 57K of spreadsheet data. This is, without doubt, the Achilles heel of the program. Even I, a moderate, occasional spreadsheet user, have created a 65K VisiCalc model; it just won't fit into Perfect Calc. Moreover, the newfound ability to stuff up to seven models into memory at once makes running out of memory almost inevitable.

An annoyance of a rather different sort is the user interface created by Perfect Calc's designers, to the extent that this is a matter of taste, my taste differs markedly

from theirs. Nevertheless, there are objective grounds for criticism.

Perfect Calc works like Perfect Writer: anything and everything is done by keying in commands consisting of a sequence of characters, usually—but not always!—while holding down the control (Ctrl) key. Many programs work in a similar manner, including WordStar, but the best ones pro-

## ALTHOUGH A few of the standard PC keys work as expected, most don't.

vide a menu or prompt showing possible choices to help a novice learn the commands. Not Perfect Calc. You gotta memorize 'em, and believe me, it's not easy.

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- Ability to play multiple (e.g. 20, 50 or more) games with the same lineups, with only the final score being printed. These games take less than two minutes each. You can use this option to test various lineup combinations.
- Ability to make trades, create new teams, hold a "free agent draft"
- In addition to printing a box score, the program will update league standings and statistics; you can access the statistics, and print out "League Leaders" for the various statistical categories.

This package is more than just another computer game. It is a complete set of programs which allow you to simulate Major League Baseball in your own home/office. Games, statistics, trades, and more.

—All programs are user-friendly and prompt-driven; you can learn the instructions in a matter of minutes. Games will take 15-35 minutes.

Here is a box score of a Home Computer Major League Baseball Game.

DATE: 04-30-1983 TIME: 22:00

1982 Milwaukee Brewers ( 1 )

NAME	AB	R	H	2B	3B	HR	RBI	BB	WALK	SO
HOLTER	5	0	0	0	0	0	0	0	0	1
YOUNT	4	0	1	0	0	0	0	0	1	0
COOPER	4	0	1	0	0	0	1	0	1	0
BISHOP	5	0	0	0	0	0	0	0	0	0
OBILVIE	2	0	1	0	0	0	0	0	2	0
THOMAS	3	0	0	0	0	0	0	0	1	2
HOMELL	3	1	2	1	0	0	0	0	1	0
POORE	4	0	1	0	0	0	0	0	0	1
BANTNER	3	0	0	0	0	0	0	0	1	0
TEAM TOTAL	33	1	6	1	0	0	1	0	7	4

NAME IP HITS RUNS ER WALK SO

CHILMELL (L)

6.2	9	3	3	2	1	
0.3	3	2	0	0	0	
1.3	2	0	0	0	0	
TEAM TOTAL	8.0	14	5	3	2	1

1982 St. Louis Cardinals ( 5 )

NAME	AB	R	H	2B	3B	HR	RBI	BB	WALK	SO
HEAR	5	0	1	0	0	0	0	0	0	1
POORE	5	1	2	1	0	0	0	0	0	0
HEWDRICK	5	1	1	0	0	1	1	0	0	0
HEWDRICK	4	2	2	2	0	0	1	0	0	0
SMITH, L	4	1	4	1	0	0	2	0	0	0
GREENFELL	4	0	2	0	0	0	1	0	0	0
GREEN	4	0	1	0	0	0	0	0	0	0
PORTER	4	0	1	0	0	0	0	0	0	0
SMITH, O	2	0	0	0	0	0	0	0	2	0
TEAM TOTAL	37	5	14	4	0	1	5	0	2	1

NAME IP HITS RUNS ER WALK SO

FORBACH (W)

6.7	6	1	1	7	4	
0.3	0	0	0	0	0	
TEAM TOTAL	7.0	6	1	1	7	4

1982 Brewers	1	2	3	4	5	6	7	8	9	R	HIT	ERR
1982 Cardinals	0	1	1	0	0	0	3	0	1	1	6	1

Time of game 0 hours 17 minutes 54 seconds

Technical specs: IBM P.C., 64 K minimum, at least one 320K disk drive DOS, BASIC required. Printer supported, not required.

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CIRCLE 330 ON READER SERVICE CARD

tinct command sequences are many that seem similar. For example, the sequence "Ctrl-x w" changes the column width, but "Ctrl-x Ctrl-w" writes the spreadsheet to a file. The commands may look similar, but their effects are completely different. I don't like that at all. To confuse matters further, although a few of the standard PC keys work as expected (the up arrow key moves the cursor up), most don't (the PgUp key does nothing; instead, you use "Ctrl-z" to move up one page).

The online Help function leaves a good deal to be desired. If you ask for help, Perfect Calc displays a list of topics. Choose a topic, then Perfect Calc gives a brief summary of applicable commands and key sequences. That's clumsy.

Better programs have what are called "context-sensitive" menus or Help functions. A context-sensitive Help function makes a guess at what you might need, and provides the necessary information right away, saving you the bother of reading through half a page of unwanted information. Such a scheme works well with programs that have logically grouped key sequences. If all Perfect Calc commands that accessed files started with "Ctrl-f" (unfortunately, they do not), then pressing the Help key after pressing Ctrl-f would provide assistance with file commands. Similarly, the main Help menu might list all possible control prefixes, one to get at each group of commands.

There are other good ways to integrate

**THE CLUMSY USER**  
interface makes Perfect  
Calc needlessly difficult  
to learn.

help functions and commands; my point is that Perfect Calc is not up to par in this respect. VisiCalc has abbreviated, context-sensitive prompts. Many of its descendants have longer, clearer prompts of this sort. For this reason alone, these programs are easier to learn.

The clumsy user interface makes Perfect Calc needlessly difficult to learn. Occasional users will find it hard to



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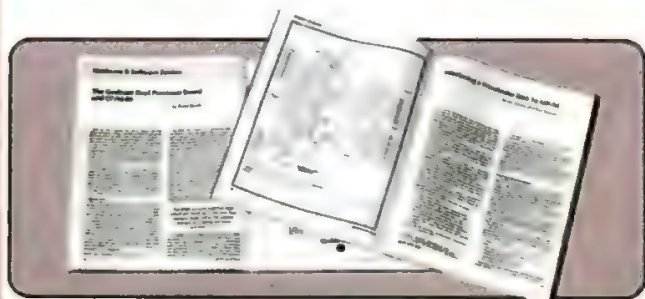
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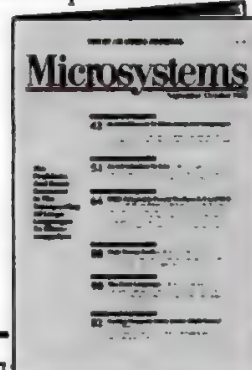
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remember after first learning it. Perfect Calc advocates might argue that this style of command language is hard to learn but easy to use. Fair enough—if you use Perfect Calc three or more times a week, I predict you'll eventually get the hang of it. It is, according to the manual, very much

## **P**ERFECT CALC *updates the screen very slowly, much more slowly than other spreadsheets.*

like Perfect Writer, so perhaps regular users of that program would not have such difficulties with this spreadsheet.

In shopping for a spreadsheet, you should also keep in mind that there are database management systems, graphics packages, accounting systems, pre-defined templates, and books available to the VisiCalc user. A Perfect Calc user can rely upon none of these resources, because the program neither supports the DIF files used by most business graphics programs, nor is its normal file format compatible with VisiCalc.

The manufacturer's PC implementation of Perfect Calc has more than a few unpolished spots. Perfect Calc updates the screen very slowly, much more slowly than other spreadsheets. The contents of my spreadsheet disappeared when I ran out of memory; the program also gave no warning of floating point overflows or underflows. Even worse, I managed to crash the program several times—always a bad sign.

The features of Perfect Calc compare well to many of the other spreadsheet programs. If Perfect Calc were anything but a spreadsheet, I might forgive its weak points and praise it for its innovations. But, in the ultra-competitive world of super spreadsheets, Perfect Calc's problem areas—the limited memory utilization, the idiosyncratic user interface, and the sloppy implementation—are real liabilities which overshadow the advantage of its multiple spreadsheet capability.

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**SHOULD**  
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become an accepted  
standard, there will  
certainly be some  
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it.*

---

ticated 16-bit microcomputers, such as the IBM PC, new opportunities, formerly available only on time-sharing and mini computers, are now within the reach of personal computer users. The increased capacity of the PC makes it practical to scale down programs that were developed for the larger computers. Consequently, sophisticated software, like *The Financial Planner*, is quickly becoming available for

## A Financial Programming Language

To best understand where *The Financial Planner* departs from mere spreadsheet analysis, you should examine the concept behind Ashton-Tate's very successful dBase II program. Most programs written for micros take advantage of the real-time interactive capability that the personal computer affords. They generally present menu-driven approaches to specific problems. dBase II and *The Financial Planner* go beyond this and actually create an operational language that can be used by relatively unsophisticated users for programming after a very short learning period. The advantage this affords is that a person with a reasonably adequate understanding of the process of programming can very quickly program a custom application that even a computer neophyte can use.

When computers are used at home as a hobby, this is not very important. However, businesses measure the worth of an expenditure by the returns it produces. The quicker a computer can justify its



existence in terms of profit, the better.

Since the FPL requires the user to have a basic understanding of financial planning, I will not spend much time in this area. Instead, I will briefly review some of the concepts involved and provide an example of financial situation modeled by *The Financial Planner*.

The concept behind financial planning is the interrelational accumulation of chronologically ordered information in order to project future events. What formerly took hours with a paper and pencil has now been reduced to a few minutes of work with a computer. The most time-consuming portion of this process is the design of a spreadsheet model and entering of data. "VisiClones" are, for the most

part, cell-oriented; that is, each cell is considered an individual entity. *The Financial Planner* makes the same departure as *MicroPlan* of orienting the entry and projection of data on a row-by-column basis. This saves time; it also encourages a different type of thinking. The program's author has designed a language that can be used to quickly alter the data in the file. This can be done on an interactive basis or by editing in a word processing fashion.

*The Financial Planner* is composed of two menu-driven subsystems. The first part is the Editor. This works much like a line editor, allowing the user to enter commands that will later be processed. *The Financial Planner* supports a sophisticated high-level language, in some ways sim-

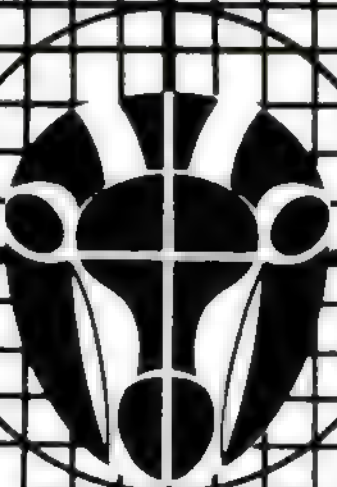
ilar to *dBase II*. Commands are simple English words that can be abbreviated for speed and simplicity. Through the use of the Editor, you can define what the model will look like in terms of rows and columns, include initial data, express formulas, and define a program path. You can even include text to prompt the user for input that will later be used in calculations. The Editor constructs a file on disk that can be re-edited with either the Editor or a word processor.

Information entered under the Editor falls into one of three categories: data, rules, or text. The text is used simply to define the name of the rows and columns and the report titles. Text can be used from a previous model by inserting a FROM

Figure 1: A list of the commands in the Editor subsystem of *The Financial Planner*.

<b>Add</b> <div> <div> Rows {row name}  Columns {column name}  Variables {variable name}  Data {line number}  RULes {line number}  Text {line number} </div> </div> <p>Adds new statements to the named section.</p>	<b>Init</b> Clears model description of all statements.
<b>Change</b> <div> <div> Rows {row name(s)}  Columns {column name(s)}  Variables {variable name(s)}  Data {line number(s)}  RULes {line number(s)}  Text {line number(s)} </div> </div> <p>Changes statements in the named section.</p>	<b>List</b> <div> <div> entire model  Rows {row name(s)}  Columns {column name(s)}  Variables {variable name(s)}  Data {line number(s)}  RULes {line number(s)}  Text {line number(s)} </div> </div> TO { {Printer} } {/LN} <p>Lists all statements or only those in the named section to the printer, another file, or the terminal (by default). /LN suppresses line numbers.</p>
<b>DEFine</b> <div> <div> Data {Define entire model}  RULes {Define Data section}            {Define Rules section} </div> </div> <p>Defines the entire model description or the named section.</p>	<b>MONTHS</b> {number} {START=mmm} {YEAR=yyy} {Quarters} {'text'} {'text'} {FISCAL NOTOTALS} {(n)} <p>Creates names and titles of the months of the year for rows or columns.</p>
<b>DSS</b> Loads the Decision Support System.	<b>Quit</b> Terminates the Editor session and returns to the Planning Menu.
<b>Delete</b> <div> <div> Rows {row name(s)}  Columns {column name(s)}  Variables {variable name(s)}  Data {line number(s)}  RULes {line number(s)}  Text {line number(s)} </div> </div> <p>Deletes statements in the named section.</p>	<b>Renumber</b> { Data } {current line number, (increment)} { RULes } new line number { Text } <p>Renumbers all or specified parts of Data, Rules or Text section.</p>
<b>Exit</b> Terminates FPL and saves the most recent model description on the disk.	<b>RESERVE</b> number { Rows } {'text'} {'text'} { Columns } { Variables } <p>Reserves a specified number of rows or columns.</p>
<b>FROM</b> filename {/LN} Directs Editor to take input from the named file.	<b>STET</b> Restores the most recently changed section.
<b>HElp</b> Lists all Editor commands with a brief description of each.	<b>UPPER</b> <b>LOWER</b> Toggles case translation between uppercase and lowercase.
<b>Hold</b> Holds or freezes information currently displayed on the screen.	





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command and the other model's name.

## Defining Data

Generally, you fill a spreadsheet interactively on a cell-by-cell basis. Most spreadsheets provide some form of copy or replicate command, but the power of most of these commands is limited. Say,

for example, you wanted to analyze a business's cash flow over a period of several months. The columns and rows are set up one at a time. *The Financial Planner* shortens this process by using one command to define monthly headings, quarterly breaks, and annual totals. The same type of shorthand applies to the initial

definition of the data. Data can be entered as a base value with a growth factor for the balance of the year.

I didn't experiment very much with the shorthand definition of data, but it seemed that the possibilities for relational data expression were extensive. The most interesting were the abilities to specify a

Figure 2: A list of the commands in the DSS subsystem of *The Financial Planner*.

### CLEAR

Clears the screen. Entries will scroll down the screen as they are entered.

### COLUMN row list

Establishes the logical column for processing.

### COMPUTE

Directs *FPL* to perform computations.

### COMPUTE/WT

Computes one rule at a time for debugging purposes.

### DEFINE Data

Resets the data values to those in the Data section of the model.

### .n

Sets the precision factor of the display to *n* decimal places.

### nD

Moves the screen down *n* rows.

### EDITING [string]

The editing control string for the entire model.

### Editor

Loads the Editor.

### EXIT

Terminates *FPL* and retains the values currently in the data matrix.

### Footnotes

To enter footnotes in the report.

### FROM filename

Directs DSS to take commands from the named file.

### H

Moves the screen to the upper left corner of the model.

### HELP

Lists all DSS commands with a brief description of each.

### nL

Moves the screen *n* columns to the left.

### B.MARGIN n

Sets the bottom margin for reports to *n* lines.

### T.MARGIN n

Sets the top margin for reports to *n* lines.

### Names {Only}

Toggles the display of names, titles or both on the screen.

### Options

Displays the current print option settings.

### OUTPUT

TO { filename  
Printer  
Terminal }

Directs the report to the file named, the printer or the terminal.

### OVER n

Sets the left margin for reports to *n* spaces.

### PAGENO Y/N

Controls whether page numbers are printed on reports.

### PAGESIZE length, width

Sets the page size for printed reports.

### Print

Prints the report.

### Quit

Terminates DSS session and returns to the Planning Menu.

### nR

Moves the screen *n* columns to the right.

### ROW column list

Establishes the logical row for processing.

### Show

{ row list  
column list }

Controls which rows or columns are printed in reports or displayed on the screen.

### SPACE n

Sets the number of spaces between columns to *n*.

### Title

To enter titles on the report.

### nU

Moves the screen up *n* rows.

### UPPER

### LOWER

Toggles case translation between uppercase and lowercase.

### Variables

Displays the name and value of each variable in the model.

### W n

Sets column width to *n* spaces.

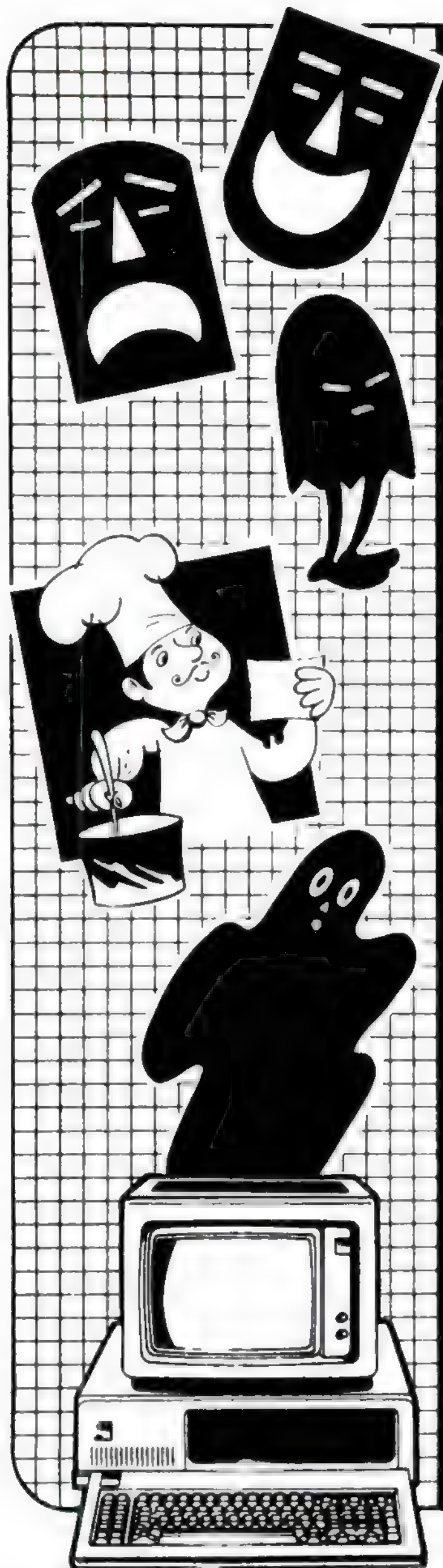
### WHATIF

To enter rules at the keyboard and have them take effect immediately on the screen.



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CIRCLE 376 ON READER SERVICE CARD



# Modeling a Manufacturer with The Financial Planner

*The Financial Planning Language can be used to model a financial situation and test out "what if" situations.*

Assume the following are true about a company's financial situation.

1. It is an operating business with current sales of \$10,000 per month growing at the rate of 6 percent, typical for a small software business.
2. After three months, sales begin to grow at an 8 percent rate as a result of advertising.
3. Material costs, initially \$500 per month, grow at a 3 percent rate for three months, increase to 5 percent for three months and will increase at a 9 percent rate during the balance of the year.
4. Support for the product stays constant at \$1,000 per month for the first 6 months, increasing to \$1,500 for the balance of the year.
5. Development is constant at \$1,000 per month with the cost of \$40,000 spread over 6 months for the development of a new product. The new product will begin to sell immediately and cause total sales to grow to a 25 percent rate.
6. Advertising initially costs \$1,000 per month, growing at a rate of 15 percent per month.
7. Fixed expenses are flat for 6 months at \$1,550 and increase to \$1,685 to reflect a new office telephone for support of the new product.

The above assumptions are incorporated in the FPL program in Figure 3. When this program is run, the spreadsheets for this financial model are printed in two

forms: the monthly budget (see Figure 4) and the quarterly budget with annual totals (see Figure 5). This report reveals that the company will show a growing profit each month after February.

This program can be used to test out different "what if" assumptions for the financial model. For example, what would happen if the new product took 8 months to develop and cost \$100,000, rather than 6 months and \$40,000? This can be tested by changing line 50 in the program's Data section as follows:

50 DEVEL=1000, 85100000, 5\*1500

By running the modified program, the new monthly (Figure 6) and quarterly/annual (Figure 7) budget reports are generated, showing the financial effects of cost overruns in new product development. The monthly report's "Pre-Tax Revenue" line reveals that the company will be in the red from February to August. By the end of the year, sales of the new product will raise monthly revenues to far higher levels (\$35,476 in December), more than recouping the earlier deficit.

This is a very simplistic financial model, but it illustrates the type of situation that can be represented through the use of a few FPL statements. This model can be saved and modified later, either as a complete unit or partially. A menu driven command file was used to print the quarterly sets of reports.

—E.V.B.

growth rate and interpolate a total over several cells. Refer to Figure 1 for a complete list of the Editor commands. Since FPL operates as a language interpreter, commands for data definitions can be combined endlessly.

## Rules

Rules make up the most powerful part of the program; they allow the user to specify the order and the manner in which the spreadsheet will be calculated. Normally, the order in which a spreadsheet is calculated is predefined by the designer of the software. With FPL, you become the designer; you determine which rows and columns are to be calculated and in what order. Rules are defined by line number and can include repeat loops, data input, variable redefinition, conditional expressions, and output commands. Through the Editor, you are able to write a program that can display menus, input data, and print reports. In this way, even a relatively new user can operate FPL and obtain some very impressive results.

## DSS—Decision Support System

The second part of FPL is what the manual calls DSS, the Decision Support System. This is the interactive part of the program. Through the use of DSS, The Financial Planner looks and acts like a spreadsheet. DSS is command-driven with English-like commands (see Figure 2). Once the user has defined a model with the Editor, DSS is used to run it. Here the best of both worlds exist.

DSS can be used to execute a series of rules in program fashion or it can be command-driven by the user. Those accustomed to normal spreadsheets will find this part of the program somewhat cumbersome. Typically, spreadsheets handle screen updating when commands are executed. This is not true under DSS. Clearing the screen requires a CLEAR command and movement about the spreadsheet is line-oriented, not cell-oriented. Once you are familiar with the command language, though, you will be able to manipulate data quickly and debug programs. By using The Financial Planner in this fashion, however, you miss its real advantage; the built-in program function. Properly designed text and rules can isolate the user from much of the actual row-and-column manipulation. This allows quicker

Figure 3: A program, called TEST, created with The Financial Planner.

```
MODEL: A-TEST
ROWS
  SALES PRODUCT SALES
  COST MATERIAL COST
  SUPPORT DEVELOPMENT SUPPORT
  DEVEL DEVELOPMENT COST
  ADVERT ADVERTISING
  FIXED FIXED EXPENSE
  BLANK
  TOTAL TOTAL COST OF PRODUCT
  NET PRE-TAX REVENUE
COLUMNS
  JAN JANUARY
  FEB FEBRUARY
  MAR MARCH
  Q1 FIRST-QUARTER
  APR APRIL
  MAY MAY
  JUN JUNE
  Q2 SECOND-QUARTER
  JUL JULY
  AUG AUGUST
  SEP SEPTEMBER
  Q3 THIRD-QUARTER
  OCT OCTOBER
  NOV NOVEMBER
  DEC DECEMBER
  Q4 FOURTH-QUARTER
  YR TOTAL/YEAR
DATA
  10 MATHROW JAN-MAR,APR-JUN,JUL-SEP,OCT-DEC
  20 SALES=10000,5>*1.06,5>*1.08,5>*1.15
  30 COST=500,5>*1.03,5>*1.05,5>*1.09
  40 SUPPORT=6*1000,5*1800
  50 DEVEL=1000,8540000,5*1800
  60 ADVERT=1000,5>*1.15
  70 FIXED=6*1800,5*1685
RULES
  1080 MATHCOL
  1080 Q1=SUM(JAN-MAR)
  1040 Q2=SUM(APR-JUN)
  1060 Q3=SUM(JUL-SEP)
  1060 Q4=SUM(OCT-DEC)
  1070 YR=SUM(Q1,Q2,Q3,Q4)
  1080 MATHROW JAN-YR
  1080 TOTAL=SUM(COST-FIXED)
  1110 NET=SALES-TOTAL
```



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## Reports

My experience with spreadsheets—and microcomputer software in general—is that very little hard copy report capability is built in. The real-time environment of microcomputers often makes the need for reports unnecessary. After all, who needs a steady flow of reports that are seldom read when the information is as close as your finger tips? As a result, the formatting of reports has been secondary to screen access information as a concern in

**T**HE FEELING  
I got from using the  
Help feature was that it  
was an afterthought of  
the author, prompted  
only by competition  
from other software.

most microcomputer software. This is fine when there is only one user and the person making the decision is the person running the computer. As computers are pushed into the business environment, however, the need to write more reports increases; especially when several people depend on the same information to make decisions.

FPL's report generation language provides a rich set of commands for formatting reports. This, coupled with the ability to process the same data, but with different user-defined inputs and conditional checks, makes *The Financial Planner* a very powerful business tool.

## Documentation

As the microcomputer industry grows and comes of age, software packaging has become a strong marketing tool. Consumers now expect that when one pays \$500 or more for a program, its documentation will be typeset and professionally laid out. Few realize that the process of packaging and documentation often takes as long as writing the program itself.

Figure 4: Monthly budget report for the original model of a company's financial situation.

### MONTHLY PROJECTION ASSUMING 6 MONTHS AND \$100,000 DEVELOPMENT

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
PRODUCT SALES	10,000	10,000	11,286	11,910	12,883	13,888
MATERIAL COST	500	518	530	548	574	598
PRODUCT SUPPORT	1,000	1,000	1,000	1,000	1,000	1,000
DEVELOPMENT COST	1,000	12,800	12,800	12,800	12,800	12,800
ADVERTISING	1,000	1,180	1,325	1,481	1,748	2,011
FIXED EXPENSE	1,880	1,880	1,880	1,880	1,880	1,880
TOTAL COST OF PRODUCT	5,080	16,718	16,905	17,117	17,878	17,968
PRE-TAX REVENUE	4,980	-6,118	-5,697	-5,207	-4,810	-3,778
	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
PRODUCT SALES	15,003	15,754	23,443	22,303	26,689	27,797
MATERIAL COST	632	689	751	819	893	975
PRODUCT SUPPORT	1,500	1,500	1,500	1,500	1,500	1,500
DEVELOPMENT COST	12,800	12,800	12,800	1,500	1,500	1,500
ADVERTISING	2,313	2,660	3,089	3,518	4,046	4,552
FIXED EXPENSE	1,885	1,885	1,885	1,885	1,885	1,885
TOTAL COST OF PRODUCT	18,631	19,054	19,485	9,082	9,823	10,311
PRE-TAX REVENUE	-3,627	-380	3,947	20,302	27,006	35,476

Figure 5: Quarterly report with annual totals for original model.

### PROPOSED PROJECT WITH \$100,000 DEVELOPMENT COST OVER 6 MONTHS

	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER	TOTAL YEAR
PRODUCT SALES	31,836	38,665	57,200	111,719	239,421
MATERIAL COST	1,548	1,722	2,073	2,686	8,029
PRODUCT SUPPORT	3,000	3,000	4,500	4,500	15,000
DEVELOPMENT COST	28,000	27,800	27,800	4,500	108,500
ADVERTISING	3,473	3,281	3,032	12,216	22,002
FIXED EXPENSE	4,880	4,680	3,066	3,066	15,410
TOTAL COST OF PRODUCT	36,868	52,164	57,100	28,966	175,098
PRE-TAX REVENUE	-6,832	-15,499	40	22,704	20,483

Figure 6: Monthly budget report produced after making changes the model to test the effect of a large cost overrun in developing a new product.

### MONTHLY BUDGET PROJECTION FOR PRODUCT DEVELOPMENT

	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE
PRODUCT SALES	10,000	10,000	11,286	11,910	12,883	13,888
MATERIAL COST	500	518	530	548	574	598
PRODUCT SUPPORT	1,000	1,000	1,000	1,000	1,000	1,000
DEVELOPMENT COST	1,000	12,800	12,800	12,800	12,800	12,800
ADVERTISING	1,000	1,180	1,325	1,481	1,748	2,011
FIXED EXPENSE	1,880	1,880	1,880	1,880	1,880	1,880
TOTAL COST OF PRODUCT	5,080	16,718	16,905	17,117	17,878	17,968
PRE-TAX REVENUE	4,980	-6,118	-5,697	-5,207	-4,810	-3,778
	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER
PRODUCT SALES	15,003	15,754	23,443	22,303	26,689	27,797
MATERIAL COST	632	689	751	819	893	975
PRODUCT SUPPORT	1,500	1,500	1,500	1,500	1,500	1,500
DEVELOPMENT COST	12,800	12,800	1,500	1,500	1,500	1,500
ADVERTISING	2,313	2,660	3,089	3,518	4,046	4,552
FIXED EXPENSE	1,885	1,885	1,885	1,885	1,885	1,885
TOTAL COST OF PRODUCT	18,631	19,054	5,406	5,082	9,823	10,311
PRE-TAX REVENUE	2,806	10,720	14,947	20,302	27,006	35,476

Figure 7: Quarterly annual report for the modified model.

### PROJECTED DEVELOPMENT OF NEW PRODUCT OF \$40,000 SPREAD OVER 6 MONTHS

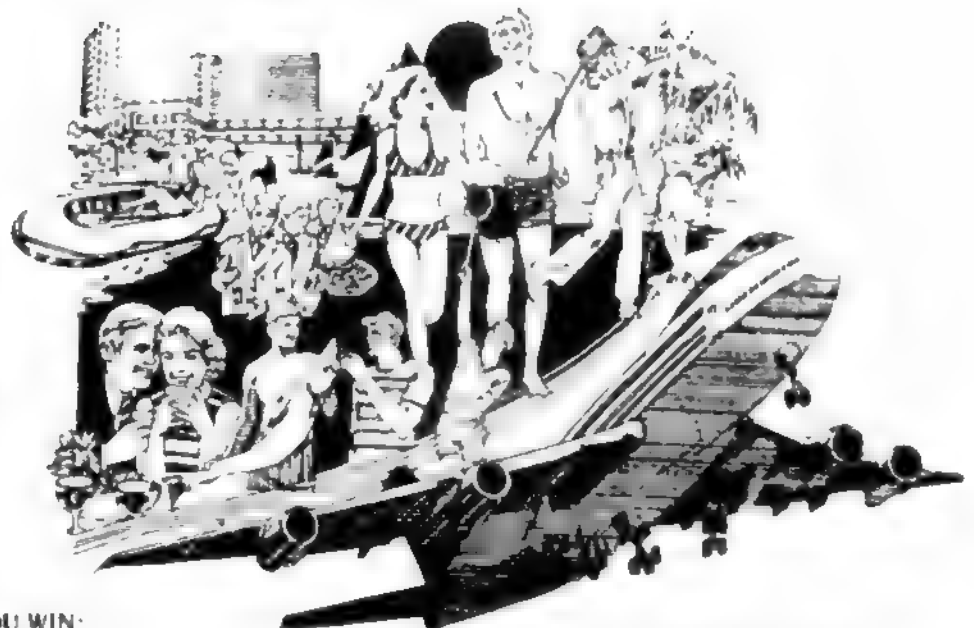
	FIRST QUARTER	SECOND QUARTER	THIRD QUARTER	FOURTH QUARTER	TOTAL YEAR
PRODUCT SALES	31,836	38,665	57,200	111,719	239,421
MATERIAL COST	1,548	1,722	2,073	2,686	8,029
PRODUCT SUPPORT	3,000	3,000	4,500	4,500	15,000
DEVELOPMENT COST	14,333	20,000	3,667	4,500	42,500
ADVERTISING	3,473	3,281	3,032	12,216	22,002
FIXED EXPENSE	4,880	4,680	3,066	3,066	15,410
TOTAL COST OF PRODUCT	27,001	34,684	22,237	23,966	112,928
PRE-TAX REVENUE	4,835	4,011	27,873	82,754	119,453



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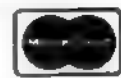


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For *The Financial Planner*, Ashton-Tate has done a straightforward job of documentation. The first few chapters lead the user through a series of lessons teaching the basics of FPL. Each chapter covers enough information so as not to bore a person familiar with computers and at the same time does not overwhelm the new user. The later part of the manual contains a more detailed breakdown of the program operation, including examples. A reference card of commands is also provided.

### Program Help Facility

To help users not used to reading com-

puter manuals, some software now incorporates the manual's information in the program itself. After you press some key, usually the ? key, several lines to several pages of text will appear on the screen as a guide. In most cases, this feature acts only to jog the memory of a person already familiar with the program. Unfortunately, the sophistication of software has not reached the point where the on-screen Help messages are cross-referenced to the manual. If that were the case, then you would have quick access to the section of the manual that would provide an expanded explanation of the necessary

command or input.

FPL does allow a breakdown of the Help messages according to the command you're interested in. This system, however, presupposes that you already know the command; in the beginning, this is most often not the case. Therefore, you end up choosing to display a complete screen of information for all the commands. The feeling I got from using the Help feature was that it was an afterthought of the author, prompted only by competition from other software. I found that the cross-reference card was much more convenient to use than the on-screen Help.

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### Best Use of FPL

The true worth of a software package is best measured by the need that it fills. Well-programmed software if poorly matched, can be as disastrous as software that simply does not work. This matching process works best when the user has a clear picture of the need that the program is intended to satisfy. Effectiveness is sometimes difficult to determine at first. Often you are best off buying a limited software package at a very low price to test how this type of program fits your needs. Once a good match between the computer and a need is determined, a more sophisticated program is worth your money.

What people often fail to realize on a first encounter with a microcomputer is the amount of time commitment that will be necessary before producing practical results. Often the hardware cost is the smallest component of the package's value; programs and data are usually worth much more. Microcomputer software has been relatively cheap because such things as word processors and spreadsheets can be mass marketed. But costs change dramatically when programs are custom tailored to meet specific needs. dBase II's remarkable success has been a direct result of the time it saves in producing custom applications and reports. *The Financial Planner* takes the concept of financial planning into the realm of inexpensive customization. The main thing you have to keep in mind before you buy *The Financial Planner* is that someone in your organization will have to be able to understand and write simple program logic if the full benefit of the program is to be realized. This is not as hard as you might think, but it does require some dedication on the part of a computer novice.





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## The Bottom Line

Overall, *The Financial Planner* is a superior product. I found it very easy to learn and use. The PC version overcomes some of the memory limitations of 8-bit spreadsheets. Most spreadsheets converted for PC-like computers have memory access limited to 128K. What this

means is that the first 64K of memory is used for the program and the data is assigned to a separate 64K of memory. The *Financial Planner* seems to have escaped some of this limitation through a file buffering method that takes full advantage of the PC's memory. Unfortunately there is no counter or other reminder of the

amount of remaining disk space, as provided with other spreadsheets.

The programming feature is very powerful and is not commonly found in spreadsheets. Since *The Financial Planner* will also be used as a spreadsheet, it would be nice if a fast screen-addressing option was available. This could be done with a separate module that would make the program more user-friendly.

Some of the commands that were common to the Editor and DSS had different functions in the different modes. The microcomputer field is so new that few industry-wide standards have been set. It is unfortunate that a leading manufacturer cannot even set a standard internally.

FPL allows conversion to and from text files so that a smart programmer could use this program to emulate Context's *MBA* or *MicroPlan with Memo Writer*. This would require a bit of work, but the tools are there. Ashton-Tate is obviously missing some of the potential of this market, as evidenced by the number of front-end programs that third-parties have made available for its *dBase II*. Should *The Financial Planner* become an accepted standard, there will certainly be some commercially available front-end programs for it also.

The retail price of *The Financial Planner* is \$700. This is higher than spreadsheets generally run, but spreadsheets usually do not contain the features found here. The only program on the market that is comparable is *MicroPlan* from Chang Labs. If the optional consolidation module is added to *MicroPlan*, its price is at the same level as Ashton-Tate's.

Since text files can be transferred from *The Financial Planner* to other programs that are compatible with text files, you might consider purchasing a simple spreadsheet for quick calculations and *The Financial Planner* to be used by office personnel who are familiar with menu-driven programs.

Ashton-Tate's support policy is superior to those of much of the rest of the microcomputer industry. It maintains a hot line for technical questions and appears to be quite capable of answering even sophisticated questions. Its update policy is also excellent, allowing for \$50 updates when available as well as correction, at no charge, of any bugs that appear. This is refreshing in an industry that often forgets the meaning of support.

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Once a programmer has invested time, sweat, and expertise in an original program, there's a potential payoff in selling

this software to customers with similar problems. Sometimes a business finds undertaking the development of a major piece of applications software is cost justified only by the potential for the business—or the programmer—to market the resulting software.

Programmers who used dBASE II to write market-worthy software packages have found themselves in a bind. If they intended to sell this software, they'd have to face the fact that they had, perhaps unwittingly, become commercial partners with Ashton-Tate. Up to now, Ashton-Tate has held to a hard bargain that few programmers have been willing to swallow. The manufacturer had required that each copy of the new program include a licensed copy of dBASE II. That extra \$700 has driven the price of most applications

programs far beyond the market's reach.

Few programmers have brought their software to market this way, especially since dBASE II has offered no protection in return. The applications programs could be made available only in an interpreted form—that's unprotected code which purchasers would easily examine, copy, and pirate—especially if the cost of an Ashton-Tate license has upped the ante of the program's list price. These conditions have frustrated many programmers who might otherwise have taken advantage of dBASE's powers as a language.

The makers of dBASE II have finally taken several steps to make its partnerships with programmers happier. Ashton-Tate, has opened up communication by publishing *Application Junction*, a newsletter that will publicize applications pro-



grams that use dBASE II. More significant is that it has released dBRUN: a run-time package that a third-party programmer can license to include with a product for only \$100 a copy. In addition, applications programs can now be protected from

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## ***d**BASE II USERS give the program commands through a high-level computer language.*

---

their purchasers by using the dBCODE file in dBRUN for encryption.

The impact of this change in Ashton-Tate's approach can be seen clearly in the experience of a programmer who chose to use dBASE II as a language.

### **Political Programming**

When Hugh Poynor accepted the assignment of developing a comprehensive microcomputer program to manage the business end of a California state-wide political campaign, he knew what he needed: a database to manage the large lists of contributors; an accounting system to keep track of campaign expenditures and income; and an editor to write and print reports for the state's election commission and other agencies, as well as the thank you letters to contributors.

The program needed to be flexible so that it could be adapted to changing requirements and regulations and, if necessary, repaired quickly if an unforeseen bug should develop in the midst of a heated campaign. It had to be so easy to use that even a campaign volunteer with no prior computer experience could at least do data entry. For these reasons, Poynor selected a menu-driven approach.

Furthermore, the program had to be transportable so that it could be used with 8-bit CP/M-based microcomputers, the IBM PC and other 16-bit systems. Of course, the source code of the program had to be "hidden" to protect the programmer's investment of time and knowledge.

Having had 20 years of computer experience, Poynor considered a number of options, including Microsoft's MBASIC;

Digital Research's CBASIC; CB-80, Microsoft's compiled BASIC; and Softech's version of UCSD-p Pascal. But the complexity of building a full-scale database in these languages was troubling.

An attractive alternative was dBASE II, a popular database manager developed several years ago by Ashton-Tate of Los Angeles. dBASE II users give the program commands through an easily mastered high-level computer language with instructions such as ERASE, ACCEPT, STORE, IF, ELSE, ENDIF, WAIT, and RETURN. Using dBASE II, a wide variety of management systems can be created, ranging in complexity from simple mailing list programs to complex menu-driven programs with many of lines of code.

Unfortunately, programs written in the dBASE II "language" are interpreted and will only run after being called by the main dBASE II program. Since the retail price of dBASE II is \$700, the cost of selling a program written in the dBASE II language is quite expensive by microcomputer standards. Another potentially serious problem is that the dBASE II instructions needed to create the program can become available to anyone using the program. With a few cosmetic changes, a software pirate could sell Poynor's program under another name.

Fortunately for Poynor and for thousands of others fluent in the dBASE II language, Ashton-Tate has developed a solution to both problems. dBRUN, a run-time package for dBASE II programs that has been released recently, now makes it possible for dBASE II owners to sell the programs they have written in the dBASE language for a comparatively modest \$100 run-time license.

### **A Run-Time Package**

What is a run-time package and how does it work? Although Ashton-Tate (in a move roughly equivalent to Toyota's trademarking the term "AutoMobile") has stamped a trademark on the word "Run Time," the concept is hardly original.

One of the earliest and most popular run-time packages was designed by Gordon Eubanks for his CBASIC language. (CBASIC and CBASIC-86 are now marketed by Digital Research.) Programs written in CBASIC are converted into what is known as intermediate code. If you are using the compiler program, you can "in-

terpret" this code later using another CBASIC program. Among the advantages of using CBASIC (and now dBRUN) is that it supplies a high degree of transportability between operating systems. For example, programs written in CBASIC for 8-bit machines can run without modification on the IBM PC under CP/M-86 using CBASIC-86. This was proven to be very useful during the transition period after the introduction of the IBM PC, when there was comparatively little high-quality business application software available for the PC.

Under dBRUN, when the author is fully satisfied with his application program, he then runs it through a special file called dBCODE. The dBCODE file encrypts the dBASE II instructions, preventing the person using the program from reading them. dBCODE also converts or "crunches" the words used in the dBASE II language to one or two character "tokens," reducing the size of the program.

Once the dBASE program has been encoded, it can only be used in conjunction with the dBRUN program. According to the company, dBRUN implements "almost all of the features of dBASE II itself." Users of the program report that few if any modifications are necessary for their programs to work under the run-time option. The obvious limitation for both the developer and the user is that, like any program

---

## ***d**BRUN SUPPLIES a high degree of transportability between operating systems.*

---

in any compiled language, once the code has been committed to the run-time package, it can only be modified by the original author who must return to his or her source program, make and test the changes, and run the revised program through dBCODE again.

The addition of a run-time option for dBASE II means that non-programmers will be able to create highly customized database programs for individual custom-



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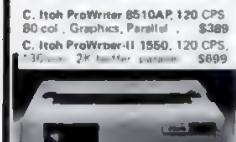
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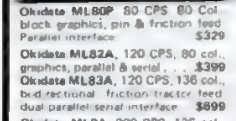
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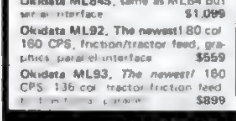
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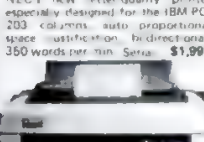
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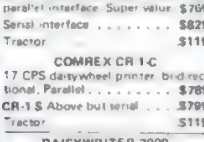
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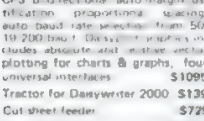
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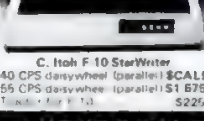
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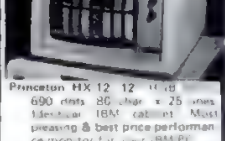
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ers, using the high-level dBASE II language. This will probably lead to the creation of specialized programs such as Poynor's that are tailored not only for a particular industry, but for a particular city, state, or region. This strategy is clearly designed to set dBASE II apart from the growing crowd of high-quality database managers competing for shelf space in the IBM PC software market. Among the other contenders are Innovative Software's TIM and integrated spreadsheet/database programs such as Context MBA, 1-2-3 from Lotus, and KnowledgeMan from MDBS.

Another significant program that offers a run-time option similar to dBRUN is Formula from Dynamic Microprocessor Associates. Formula II, expected to be available for the PC in June, is a menu-driven application generator that includes a basic accounting package and a screen design system. Applications programs created with Formula II run very quickly since the program generates code that closely resembles the computer's natural language.

## **P**ROGRAMMERS *must become knowledgeable in the fields or businesses of their clients before they can design effective programs.*

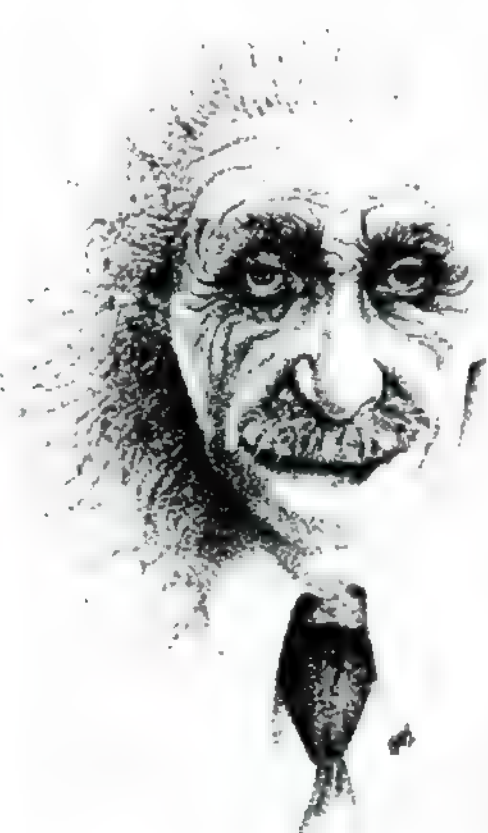
### **What Programmers Should Know**

According to Hugh Poynor, programmers must become knowledgeable in the fields or businesses of their clients before they can design effective programs: "As custom software developers, one of our main philosophical cornerstones is that a dyed-in-the-wool programmer has no business writing business software. The best application software author is someone with substantive knowledge in a special area. Dentists know the most about the requirements of dentists wanting to

computerize a portion of their practice. Economists know about statistics. Inventory managers know about inventory levels and sales management. Most programmers don't understand anything about any of these areas.

"For that reason, we, as application designers, openly acknowledge our weakness in any specialized area. Our first job when writing an application program is to become as expert in the specific field as the people we are working for."

Poynor and his partner/wife Lee followed this philosophy in the design of the campaign reporter program. As Poynor explained: "We spent two months reading regulations and interviewing our client, a campaign treasurer. During that time, no programming was done. When we felt we were indeed 'experts,' we designed the screens for the package which we showed to our client. Then, having made certain that the flow of information between the user and the program would be correct, we wrote the code." As a result, 8,000 lines of dBASE II code were written for the cam-



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paigned reporting systems, which included multi-level passwords, a built-in editor, and the ability to select a list of potential contributors from criteria selected by the operator of the program.

One of the beauties of the dBASE language is that much of the code that Poynor wrote for the \$1,800 California Campaign Reporting System can be used by him to create similar campaign reporting programs for other states. A national campaign reporting system is also said to be in the planning stages.

To add further value to the dBRUN option, Ashton-Tate is committed to after-sale support of dBRUN. A special newsletter called Application Junction will soon bring new dBRUN programs to the attention of other dBASE II users and software marketers. Software standards, documentation guides, and a marketing referral service called dBASE II Applied are now being developed for dBASE II application programmers.

Programmers must purchase the dBRUN package for each program they

plan to sell. Programmers wishing to sell dBASE applications using dBRUN must purchase the package directly from Ashton-Tate, file an application explaining the purpose and intended market for the program, and deliver copies of the program's user documentation and advertising material. A minimum order of five

**T**HERE ARE VERY few things that dBASE II cannot do.

dBRUN licenses at a cost of \$100 each is required to enter the dBRUN application software business.

Is dBASE II the right program for the businessman who wishes to either write a customized database for his own business or sell a database to others? The answer is

yes. Since its inception, dBASE II has been regarded as a high-quality product. Although it is not particularly fast by today's standards, there are very few things that dBASE II cannot do. Consequently, a large number of programmers and database designers have become fluent in the dBASE II application language. In addition, a number of inexpensive, high-quality tools have been developed to make learning and using dBASE II easier. Among these are Fox & Geller's Quickcode, dUtil, Quickscreen, and dGraph and HumanSoft's dBplus. If you are planning to use dBASE II or any other program for a major project, however, you should talk to people who have used the product rather than just heard about it and explain to them the application you have in mind.

It is still too early to tell if dBASE's shift from database to language will extend its commanding position in the 8-bit CP/M computer world to the 16-bit PC marketplace. Given the success of software applications writers such as Hugh Poynor, however, indications seem positive. /PC

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# HOW TO CHOOSE A COMPUTER CAMP





**N**ot so long ago, a child going to summer camp was in for braiding lanyards, learning bird calls, and reading Indian smoke signals. But this summer's camper is just as likely to sign up for "hands on" time with a computer.

It's hard to believe that the first computer summer camp opened only 6 years ago. Intensive residential programs in computer science are now available in all regions of the continental United States. Though definitive figures aren't available, I compiled a 33-camp directory.

What do computer camps offer? At

their best, they give a solid grounding in computer skills not routinely available in either public or private schools, without excluding the traditional summer-camp activities. And, as the inheritors of a computer-oriented society, youngsters find this a major advantage.

Computer-settings vary dramatically. Henry Dahlberg's computer camp located in the mountains outside Prescott, Arizona, offers a surprising juxtaposition of high-technology and frontier surroundings. At the other extreme is the "computer village" in Club Med's lush and luxurious Punta Cana resort in the Dominican

Republic, which will offer workshops for both children and adults all this summer. Most camps are more urban. Many are set on prep-school and small college campuses. Week-long, nonresidential programs for suburban and city children in churches, synagogues, and libraries (such as those offered by Computer Camp International's Computer U) are a viable alternative for families that can't afford residential programs.

The camps solicit a varied clientele. Though most camps cater exclusively to children and teens, some offer family and adults-only programs. Their organizations





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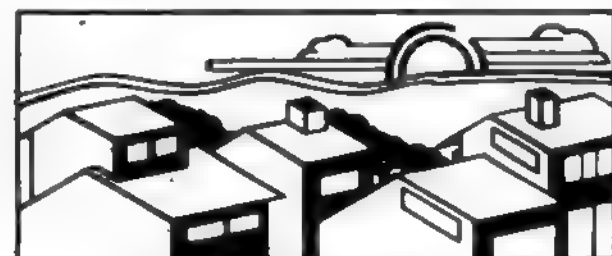
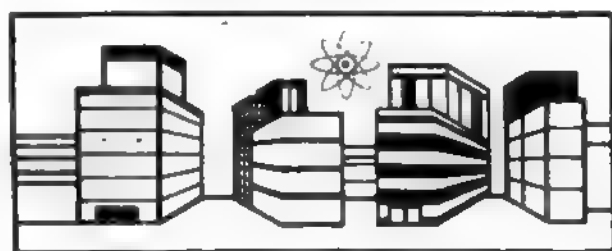
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range from well-known chains such as Computer Camps International, CompuCamp, National Computer Camp, Original Computer Camp, and Champlain College Computer Camp to one-site, independently-owned camps.

The process of selecting a camp for yourself or your child is complex. There are important differences in price, size, computer type, instructional quality, educational objectives, curricula and non-

## COMPUTER summer camps demand more from children than other camps do.

computer activities. Not all the information you need can be gleaned from the brochures. Decide what you want from a camp, what you can afford, then speak with staff members. Directors of the major camps say that they welcome calls from prospective campers or their parents.

### Choosing a Camp

The following questions may help you decide on an appropriate camp for your child or teenager. Is your child suited to this type of experience? There's no question that computer summer camps demand more from children than other camps do. In addition to instruction periods, campers usually spend a minimum of 4 hours in front of computers each day. Children with academic or psychological problems may benefit more from camps that emphasize crafts and nature. However, kids needn't be whizzes to attend; good camps offer programs tailored to slower learners, too.

How flexible are the curricula? Clark Adams, director of the Connecticut-based Computer Camps International, says, "Because many computer course offerings are new, teachers don't always know which material should be taught to which age group. Kids aren't learning computing in predictable, age-appropriate ways." This means that a 9-year-old camper may be taking a class geared to a teenager or vice versa. The 9-year-old and a 14-year-old may also be assigned to the same class

## Computer Camps cont.

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with the same materials. This calls for a staff sensitive to each child's capacities and an extensive and adaptable curriculum. The staff of CompuCamps, a Minnesota concern, conducts detailed telephone interviews with each child to pinpoint skill level before the child arrives. A good camp takes pains to balance a child's need for an appropriate level of stimulation with his wish to be with his own age group. Be sure to ask camp personnel how

# KIDS NEEDN'T be whizzes to attend.

they handle these considerations. Many of the larger camps enroll a population large enough to group children by computer literacy levels within their age groups.

How extensive are the curricula? Clark Adams points out that children often have



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## PC MAGAZINE 559 JUNE 1983



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---

all campers are interested in the non-commercial aspects of computing, such as playing and composing music, graphic designing, robot building, game designing and playing, and "telephoning."

---

**A**N IDEAL  
*instructor might have  
degrees in both  
education and computer  
science.*

Also check to see whether an "ongoing" curriculum is offered. If a camper successfully completes one course, is there a higher level course offered? Make sure too that languages are taught in a sensible progression: Is BASIC followed by Pascal, not Assembly?

What are the teachers' qualifications? To be effective, a computer instructor has to know as much about children as computers. If a summer program employs university-level teachers, make sure that they also know how to present material at a child's level. An ideal instructor might have degrees in both education and computer science.

Are there guest speakers? Though guest lecturers aren't a necessity, they can be very inspiring to older teens. Speakers can give teens a sense of the career options in the computer field.

How much computer time is scheduled? An inflexible program that either requires children to spend long hours on the computer or that severely limits the hours an interested child can spend on it are equally inadvisable. Try to find out about the scheduling options of the camp and decide if they are appropriate for your child.

What's the child-to-computer ratio? Many camps, including Vermont's Champlain College Computer Camp and the Antioch College Computer Camp in Ohio, offer a one-computer-per-camper ratio. This arrangement guarantees a child the maximum return for his computing time and is considered the optimal formula.

However, some experts question whether it's desirable for each child to have access to his own computer. National



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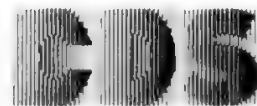




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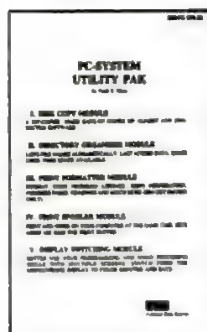
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Computer Camp founder, Michael Zabin-ski, says that he does not allow a one-child-to-one-computer ratio. His camp schedules two children per computer,

**MAKE SURE**  
that you won't be  
learning about the  
loftier aspects of  
programming at the  
expense of your  
immediate concerns.

based on his premise that children learn more in pairs.

How good are the noncomputer offerings? In addition to computing classes, most camps also offer activities such as sports, crafts, dramatics, nature hikes, and conservation work. The Catalina Sea Camp at the Catalina Island Marine Institute in Avalon, California, combines computer with marine-biology studies. Consider too, the quality of food and accommodations as well as opportunities for campers to mix with children from other areas and backgrounds.

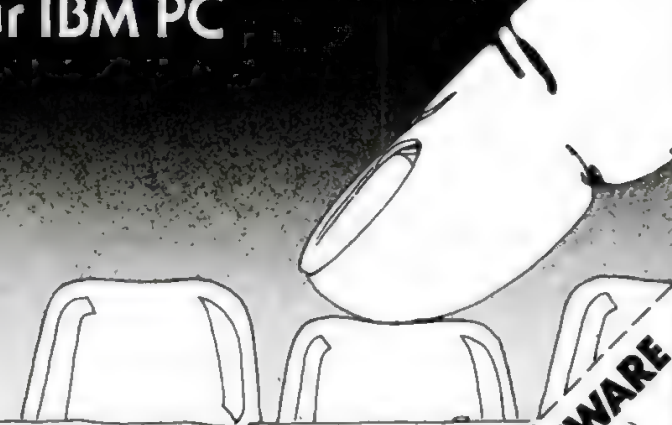
### Adult Computer Camps

Adults need cohesive, structured curricula, good student/instructor and student/computer ratios, high-quality instructors, and a pleasant environment. Their interests tend to be more specialized than children's, especially if they have just bought a computer. They may plan to learn word processing or to set up an accounting system for their home or business. If your aims are practical, make sure that you won't be learning about the loftier aspects of programming at the expense of your immediate concerns. You may not be interested in programming at all; you may just want to learn how to use good commercial software.

Although camp programs for adults often take a practical approach, they are not necessarily a substitute for a good computer job-skills class. If you are trying to add computer knowledge to your list of marketable skills, you should also investigate other academic programs. /PC

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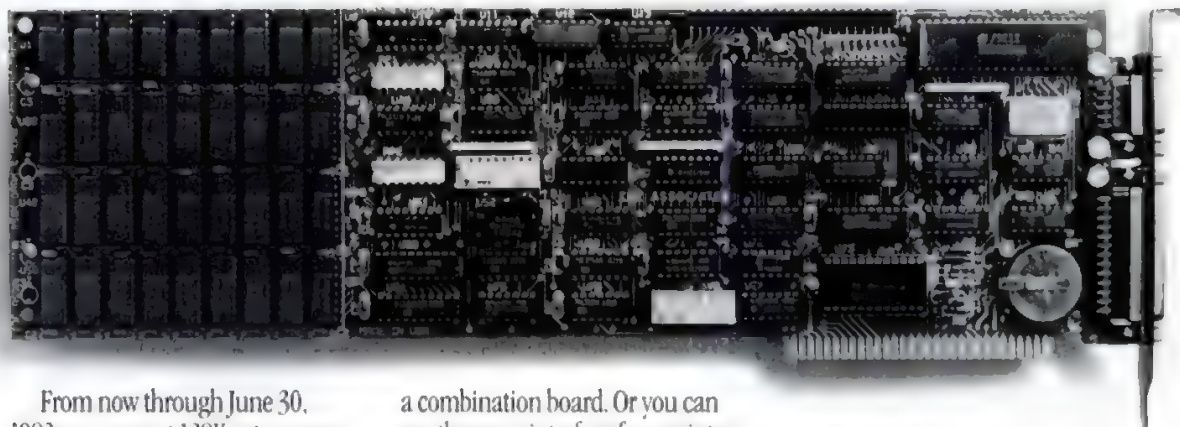
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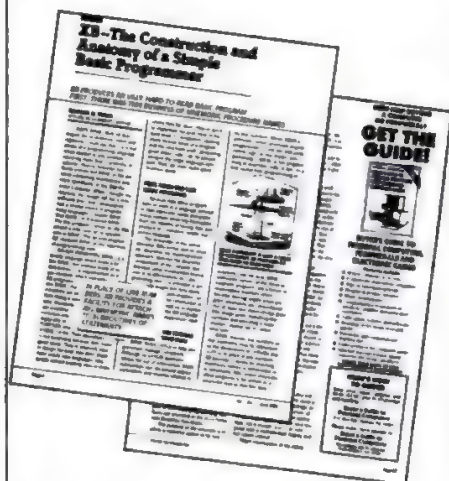
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A careful look at the form and function of all parts of the PC.

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What it is designed to do and how you can make it perform.

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A review of this well-designed set of 14 programs.

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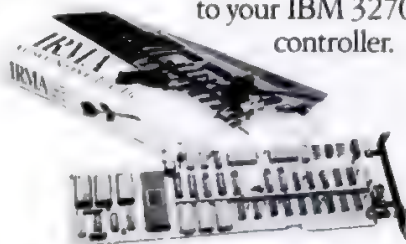
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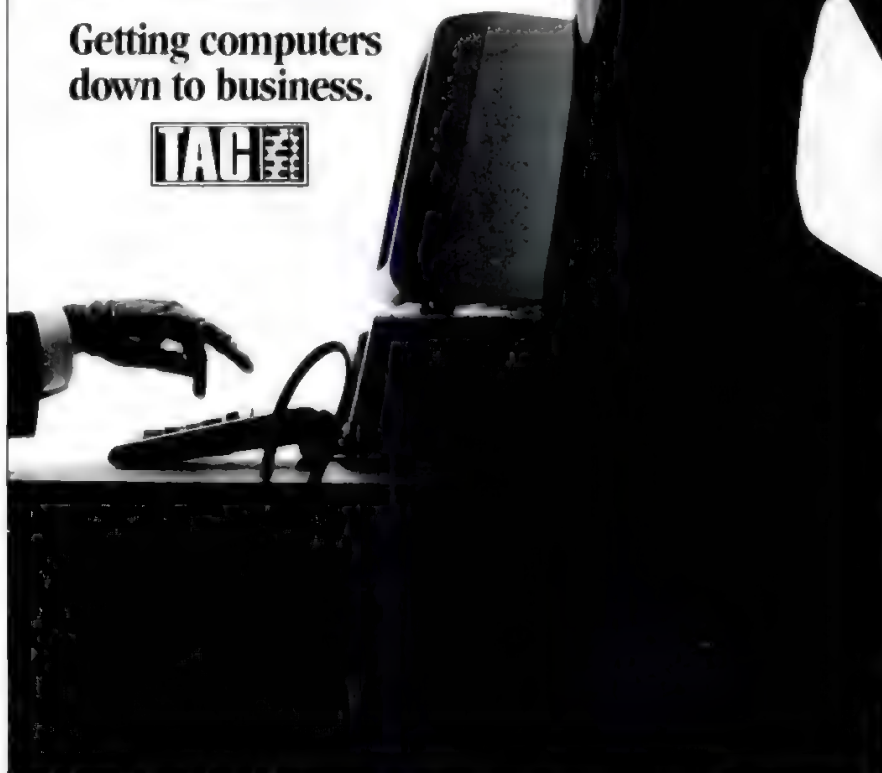


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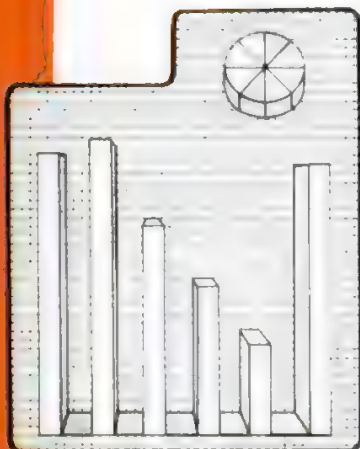
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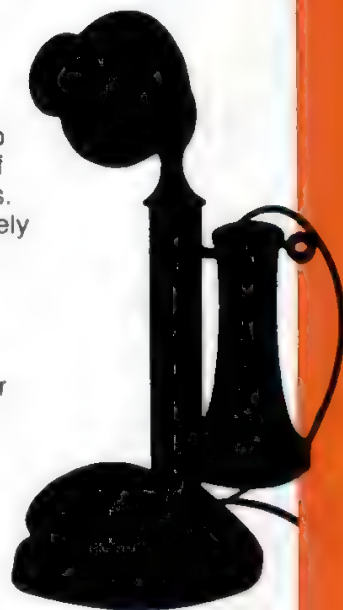
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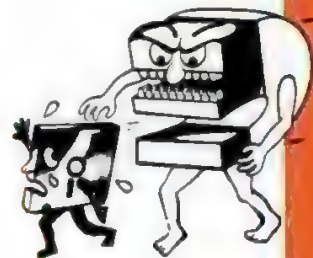
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EDITED BY BILL MACHRONE

*PC readers help each other by passing along their tips and tribulations. This time they've solved problems with printers and pauses.*

# User-To-User

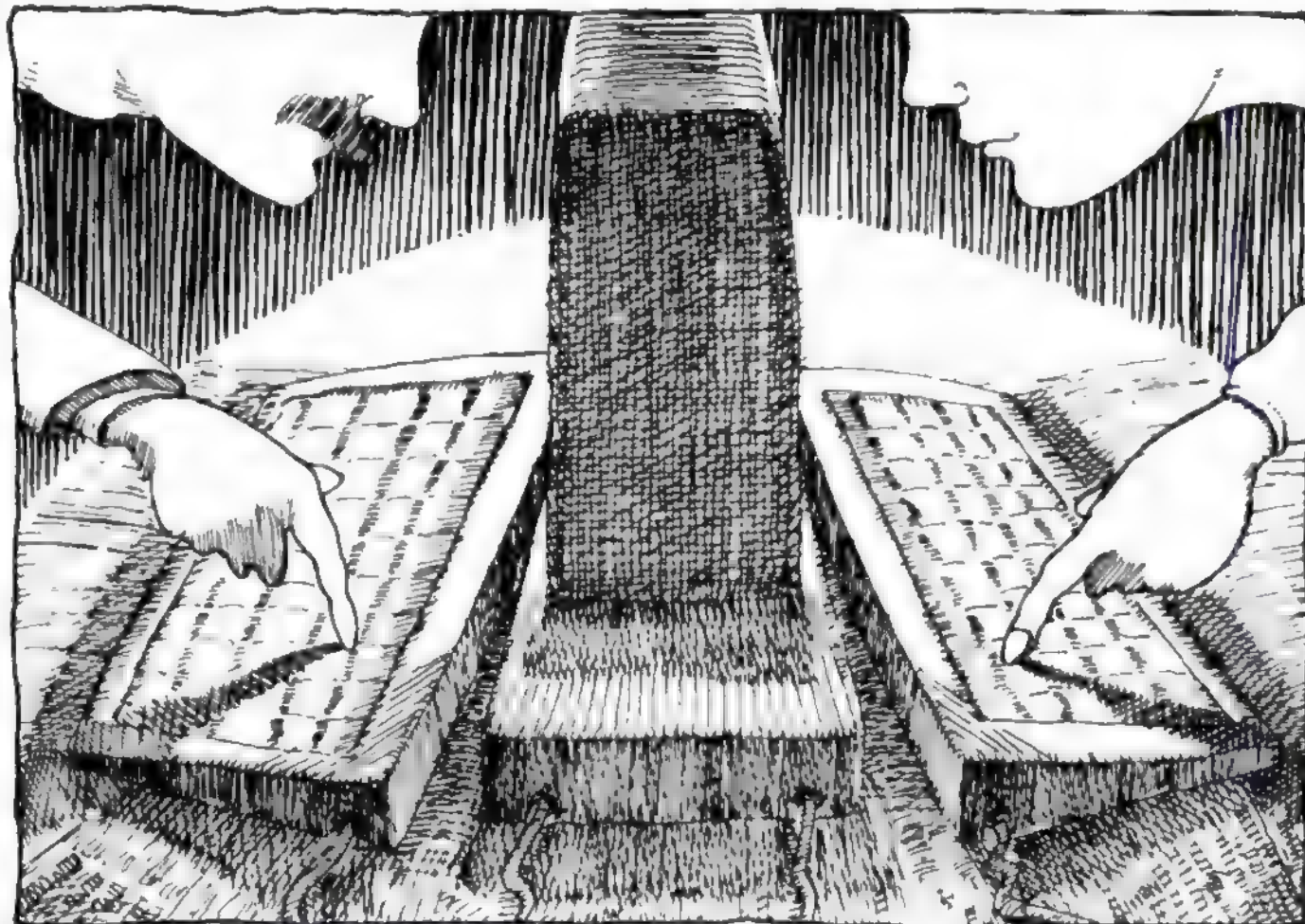
This month's column addresses a number of topics that will be of interest to many: getting BASIC to print to a serial printer, overcoming copy-protection limitations with half-height drives, another time delay technique for BASIC programmers, and a couple of tricks you can do with BASIC to give you more control over programs and improve your productivity.

## Talking to a Serial Printer

When I bought my IBM PC, I also purchased an AST Combo+ card to provide additional memory, serial I/O, and a battery-backed-up clock. Since I didn't own a parallel printer, I didn't have a parallel I/O

port installed on the Combo+ card. I also got the color/graphics adapter from IBM.

My problem came when I tried to print while in BASIC. After I set the COMM: speed, the MODE command worked very well in DOS 1.1 in steering the output from the usual parallel printer to the Asynchronous Communications Adapter look-alike on the Combo+. When I tried to do an LLIST in BASIC, however, I got a "Device Not Available" error message. That really surprised me, because I thought BASIC was supposed to be device independent. I tried everything from soup to four letter words and nothing worked. Then I tried opening the COMM: device as a file and did a PRINT#. That worked! Elated, I tried LPRINT. Nope. Drat! Same



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nasty message. I knew the printer was there since MODE had taken care of that. Or had it?

## **SOME COPY** *protection schemes involve changing the gap between disk sectors.*

On a hunch, I borrowed a parallel printer adapter card from the Computer Store in Rochester, installed it, and tried LLIST. It worked. LPRINT worked fine, too. I took the parallel adapter card out and that nasty message came back. It turns out that BASIC is not so device independent after all. It goes looking for the parallel port long before it ever sends anything to be printed, even though PC-DOS will

redirect the I/O. I installed a parallel I/O port on the Combo+ board and now I'm back in business. The connector for the interface wasn't required, just the interface. Of course, if you have the IBM Monochrome Adapter you won't have this problem because that board already has a parallel interface.

Dale Dewey  
D2 Engineering  
Victor, New York

### **New Heights with Half-Height**

Many of your readers may have purchased the new TEAC half-height floppy disk drives. If so, they may encounter problems reading some copy-protected disks. For example, the Microsoft *Flight Simulator* may not load properly.

The problem arises from something rather mysterious called "head load." Unlike Tandon drives, the TEAC units contain a small solenoid that holds the head away from the disk surface until a read or write is required. Since some copy-protection schemes involve chang-

ing the gap between disk sectors and thus rely on precise timing to determine where the irregular sectors are, the minute amount of extra time taken by the head load solenoid may cause the drive to be unable to find one or more sectors on the disk.

There is a solution, however. On the top of the bare drive, at the left rear, is the head load solenoid. Through a linkage, it activates a black metal rod that holds the head away from the disk surface.

There is a small set screw in the linkage. With a 1.5 mm Allen wrench you can remove this set screw; as a result the head will be in constant contact with the disk surface. Once this adjustment is made, the problems with copy-protected software should disappear.

## **LET US KNOW** *what your experiences are with half-height drives.*

If you are not confident enough to make the adjustment yourself, the firm that sold you the drive should be willing to do it. You may want to ask about the head load setting before purchasing the drive.

The above modification worked well for me. The information above was gleaned from several phone calls to the disk drive supplier and a software house. I found that both firms—Apparat for the drives, and Norell Data for software—were very courteous and helpful.

Robert T. McCrory  
Clackamas, Oregon

Although we have not tried this technique ourselves, our local computer store assures us that the technique is valid. Let us know what your experiences are with half-height drives.

### **Keep Time to the Sound of Silence**

A challenge faced by all programmers is portability of their code and consistent operation on all hardware. We hope that this technique and others like it forever

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lay to rest the "FOR X = 1 TO 5000: NEXT X" school of time delays.

In interactive programs it is often desirable to provide a controlled wait period. This may be done in IBM BASICA by use of the SOUND command. The normal form of that command is SOUND F, N where F is the frequency in Hertz and N is the emission period in terms of the number of clock pulses. The pulses occur at a rate of 18.2 pulses per second. If F is 32767, no sound is emitted.

After executing this statement, the program will continue until another SOUND command is encountered; then it will wait for completion of the first SOUND command.

An example of a two second pause is shown in Figure 2.

```
N = 2 * 18.2 REM duration
SOUND 32767, N REM initiate
wait state
SOUND 32767, 1 REM wait here
```

Wayne Jewett  
Lorton, Virginia

is easy to inadvertently delete a line referenced by a GOTO or GOSUB elsewhere in the program. For example, delete line 20. In doing so, you have created a dead-end reference in line 50. But there's an easy way to check for this. Just run:  
RENUM 65529, 65529

**N**O KEYS ARE  
queued up into a buffer,  
so a program can sense  
exactly when a key is  
pressed or released.

This RENUM command will have no effect on the line numbers in your program, but will list all your invalid line references. In the above case, the following will be printed:  
Undefined line 20 in 50

Having "65529 REM" as the last line of the program is also useful when deleting from mid-program to the end, since BASIC accepts DELETE 30-65529 but rejects DELETE 30-. Using this consistently will save hunting around for the last statement in your program.

Robert W. Hill  
Los Osos, California

### Overcoming the Keyboard

Here's some handy information for the BASIC programmer. PC-DOS keeps track of the NumLock, CapsLock, and ScrollLock key states by setting and resetting bits in low memory. A BASIC program may alter these bits, for example, to force entry of uppercase characters from the keyboard, or to automatically toggle the numeric keypad to be ready for either cursor control or numeric key entry.

The relevant address is at 0040:0017H, as described on page A-2 of the Technical Reference manual. In Figure 1, lines 20 through 170 provide ways to test the state

### Remarkable REM

This technique works as advertised. It's a good bug-catcher for those heavy-duty programs you're writing.

Adding a dummy REM statement at the end of a BASIC program can help both in locating invalid line references and in

**I**T IS EASY  
to inadvertently delete a  
line referenced elsewhere  
in the program.

deleting blocks of code. Try this simple example:

```
10 PI = 3.14
20 REM Loop to get and print
   area.
30 INPUT R
40 PRINT "Area = "PI*R^2
50 GOTO 20
65529 REM
```

In the heat of editing a large program, it

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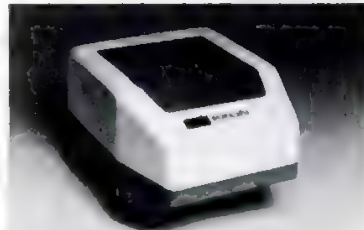


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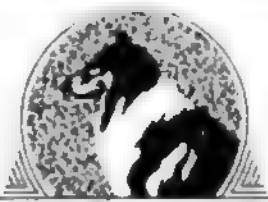


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of CapsLock, NumLock, and ScrollLock, along with ways to force and exit CapsLock and NumLock.

The state of the Alt, Ctrl, and the left or right shift keys may also be tested. See lines 200 through 290 in Figure 1.

Another byte at 0040:0018H (see Technical Reference manual, page A-3) may be tested to see if the Ins, CapsLock, NumLock, or ScrollLock keys are currently being depressed. Lines 310 to 380 in Figure 1 perform these tests.

A game program could move a paddle without using the INKEY\$ command by applying this method to test the states of

the left and right shifts or any of the other keys mentioned above. The beauty is that no keys are queued up into a buffer, so a program can sense exactly when a key is pressed or released.

Dan Rollins  
Glendale, California

Rollins' last paragraph is the most important: the here-and-now information that your program gleans from these memory locations is critical to real-time operations like games and graphic control. Setting these bits yourself frees your program's users from getting dumb

Figure 1: A program by Dan Rollins to test the state of various keys and to force or exit CapsLock and NumLock.

```

10 DEF SEG=&H40
20 REM ** test CapsLock state:
30 IF PEEK(&H17) AND 64 THEN CLOCK=TRUE
40 REM ** force CapsLock state:
50 POKE &H17,PEEK(&H17) OR 64
60 REM ** exit CapsLock state:
70 POKE &H17,PEEK(&H17) AND 191
80 REM
90 REM ** test NumLock state:
100 IF PEEK(&H17) AND 32 THEN NLOCK=TRUE
110 REM ** force NumLock state:
120 POKE &H17,PEEK(&H17) OR 32
130 REM ** exit NumLock state:
140 POKE &H17,PEEK(&H17) AND 223
150 REM
160 REM ** test ScrollLock state:
170 IF PEEK(&H17) AND 16 THEN SLOCK=TRUE
180 REM
190 REM
200 REM ** test if Alt key is depressed:
210 IF PEEK(&H17) AND 8 THEN ALT=TRUE
220 REM ** test if Ctrl key is depressed:
230 IF PEEK(&H17) AND 4 THEN CTRL=TRUE
240 REM ** test if either shift key is depressed:
250 IF PEEK(&H17) AND 3 THEN SHFT=TRUE
260 REM ** test if left shift key is depressed:
270 IF PEEK(&H17) AND 2 THEN LS=TRUE
280 REM ** test if right shift key is depressed:
290 IF PEEK(&H17) AND 1 THEN RS=TRUE
300 REM
310 REM ** test if Ins key is depressed:
320 IF PEEK(&H18) AND 128 THEN INS=TRUE
330 REM ** test if CapsLock is depressed:
340 IF PEEK(&H18) AND 64 THEN CL=TRUE
350 REM ** test if NumLock is depressed:
360 IF PEEK(&H18) AND 32 THEN NL=TRUE
370 REM ** test if ScrollLock is depressed:
380 IF PEEK(&H18) AND 16 THEN SL=TRUE

```



instructions like, "Make sure you have pressed the NumLock key."

### STRIGger Happy

This contributor also goes beyond the BASIC manual and into the depths of the Technical Reference manual to explain just how much freedom you have with joysticks and button inputs to the PC.

The Technical Reference manual's description of the Game Control Adapter states (on page 2-117) that the board will support up to four switches. These switches are the buttons on most joysticks. However, when the BASIC manual de-

## THE GAME

*Control Adapter board will support up to four switches.*

scribes the STRIG function, it only refers to the use of two of these buttons, labeled A and B.

STRIG(0) is true if button A has been pressed since the last time the channel was sampled. STRIG(1) is true if button A is currently being pressed. STRIG(2) and STRIG(3) are analogous to 0 and 1, except that they apply to button B.

Two other buttons, I'll call them C and D, are supported by BASIC but are not described in the BASIC manual. STRIG(4) and STRIG(5) apply to button C, and STRIG(6) and STRIG(7) apply to button D. (Those of you with the T&G Products joystick should note that its buttons are addressed as A and C.)

The BASIC manual also describes the "ON STRIG(n) GOSUB line" command as supporting only buttons A and B by using "n" equal to 0 and 2. However, by using "ON STRIG(4)" and "ON STRIG(6)", buttons C and D may also be used.

Brian D. Mann  
Richmond, Virginia

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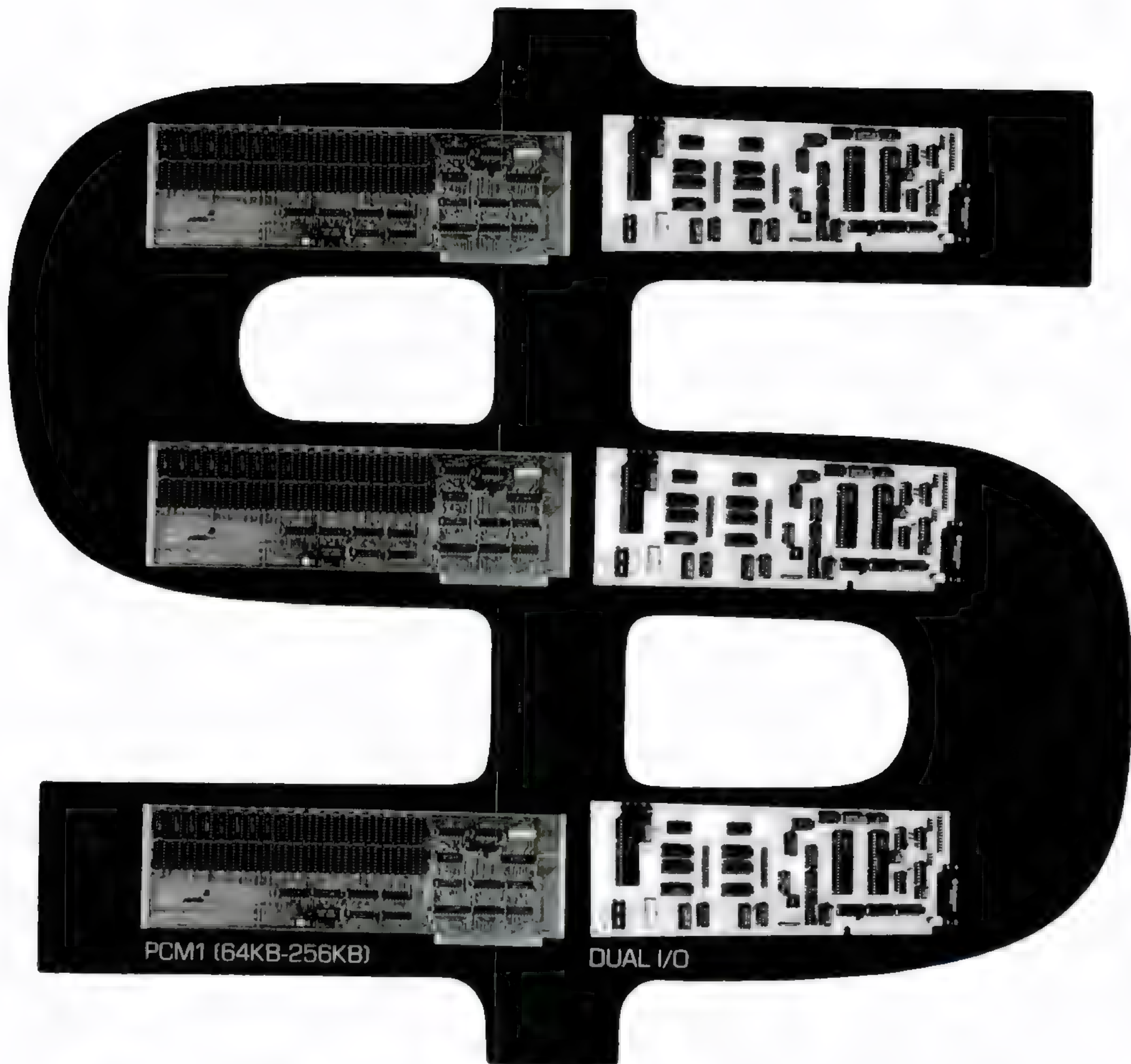
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*The IBM PC has had a wild ride on the business graphics boom. But has it missed the boat for the multi-terminal office market?*

# The Graphical PC

By now everyone knows that business graphics are booming. The phenomenon is largely due to personal computers, which have driven the cost of automated graphics production so low that businesses of any size can afford them. Even color plotters, heretofore terribly expensive, can be had for \$900 to \$1,600.

The IBM PC came into being just at the moment the graphics boom became evident. Initially, IBM's support of graphics was limited to the color/graphics adapter; no monitor device or printer capable of displaying graphical images was available from Big Blue. In the last few months IBM announced both an upgrade to the printer for dot graphics and the IBM color display; both increase the machine's utility as a graphics work station.

Even with these new devices, the PC is not "whole" as a graphics work station. There is very limited software support from IBM (with PC-DOS 2.0, a graphics screen now can be dumped to the printer), and serious plotting applications require hardware from another source. The number of graphics application packages from third parties is growing rapidly; at the

moment, the better ones seem complicated to use and expensive to buy. Furthermore, the hardware requirements of these packages may be in conflict with those of

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***IBM WAS  
very wise to make text  
presentation compatible  
from adapter to  
adapter.***

---

other packages used on the machine, especially the integrated programs. This complicates the configuration not to mention driving up its price.

Perhaps the worst problem has to do with the choice IBM made in the original design of its display adapters. A buyer's configuration decision is made difficult by the perceived need to choose between the monochrome display adapter and the color/graphics adapter, a decision aggra-

vated by the absence of a printer port on the latter. Both adapters can be purchased for a relatively small premium, but that implies using two displays as well, at considerable additional expense. This decision can be very difficult because the IBM monochrome display is absolutely beautiful for text and wonderfully easy on the eyes, but is limited to simple character graphics. Text quality on displays connected to the color/graphics adapter—even good ones like the IBM, the Princeton, and others—is at best of medium quality and is conducive to eyestrain over the long haul.

And therein lies the main problem. The high quality of the IBM monochrome display is achieved through the use of a higher, and therefore different, resolution than that provided on the color/graphics adapter. The monochrome resolution is 720 dots across and 350 dots down, as opposed to a resolution of 640 by 200 for the color board. In terms of total dots, the monochrome board delivers twice the resolution of the color board.

This choice had to be made so that the color board could provide a resolution



appropriate for use with television sets. The desire to be compatible with all types of display led IBM into this corner, and it's not clear how it will get out. One solution is to add 640 by 200 graphics onboard the monochrome board, so that a graphics capability is present. However, IBM was very wise to make text presentation compatible from adapter to adapter, and similar compatibility for graphics leads to problems of image size and aspect ratio.

IBM was very wise not to have built two different graphics technologies, one for color and one for monochrome. That

## **T** *Two products provide both color and monochrome capability on a single board.*

surely would have confused the issue beyond reason, and made the lives of software developers even more miserable.

For those with clear requirements for graphics, the color/graphics adapter is the obvious choice, albeit one which requires the additional purchase of a printer board. A number of other vendors, however, offer color/graphics boards for the PC with a variety of interesting characteristics.

The simplest of the lot is the Colorplus board, from Frederick Electronics (Plantronics). The price of the board has dropped to \$475 from an original price of \$750, making it more competitive with the IBM adapter. The product offers a completely IBM-compatible color/graphics interface, a second plane of memory that doubles the number of colors (four colors in high resolution and 16 in medium), and an integrated printer port. IBM's price for color and a printer port is \$394, so the Colorplus product is quite interesting.

Two companies offer products (neither seen by this writer as yet) that provide both color and monochrome capability on a single board. The indefatigable Tecmar offers the Graphics Master, which appears to drive just about any display and allows video images and computer-generated graphics (or legends) to be mixed. USI Computer Products offers the MultiDis-

play Card which has color, monochrome, and printer adapters; this board also has twice the memory capacity of the IBM color/graphics adapter.

At least two other companies, Orchid Technology and Hercules, have products that allow graphics to be displayed on the IBM monochrome display. Both have resolutions that match the display, about 720 by 350. The Hercules graphics card can replace the IBM monochrome adapter, while the Orchid card requires a second slot and attaches to the IBM adapter.

Confused? You should be. The bottom line is software: buy a board only if you know your programs can support the particular graphics adapter, or if the software you want requires a particular device. And make sure the device is IBM-compatible for the rest of your software.

### **XT Puzzles**

I complained about PC versus XT confusion last time. It seems IBM, at least through my local product center, has decided to call the original "PC1." Aha! One of my guesses, don't you know. Stay tuned to this channel, etc.

Meanwhile, PC1 really isn't anymore. After the XT was announced—but not in

## **M** *MICROSOFT held a seminar at which it described Xenix, its commercialized version of Unix.*

time for us to find out for the last issue—IBM announced a slightly revised version of the PC. This "new" PC has 64K of RAM installed on a system board which can be upgraded to 256K! Aha! I guessed wrong! So much for punditry. The new PC (do we call this PC'?) is a 5-slot affair, not the 8-slot motherboard I predicted.

(I just saw an ad for a memory board with 256K on it for \$295! There really is trouble in the aftermarket now, folks, but it's to our advantage.)

And finally, the brackets at the end of IBM adapter cards have changed for the XT model. These brackets fit in the standard PC. Moreover, the PC bracket can fit in the XT, although it's a tight squeeze.

## **Product Information**

*The following graphics adapters and their manufacturers are mentioned in this column.*

### **Colorplus**

Frederick Electronics (Plantronics)  
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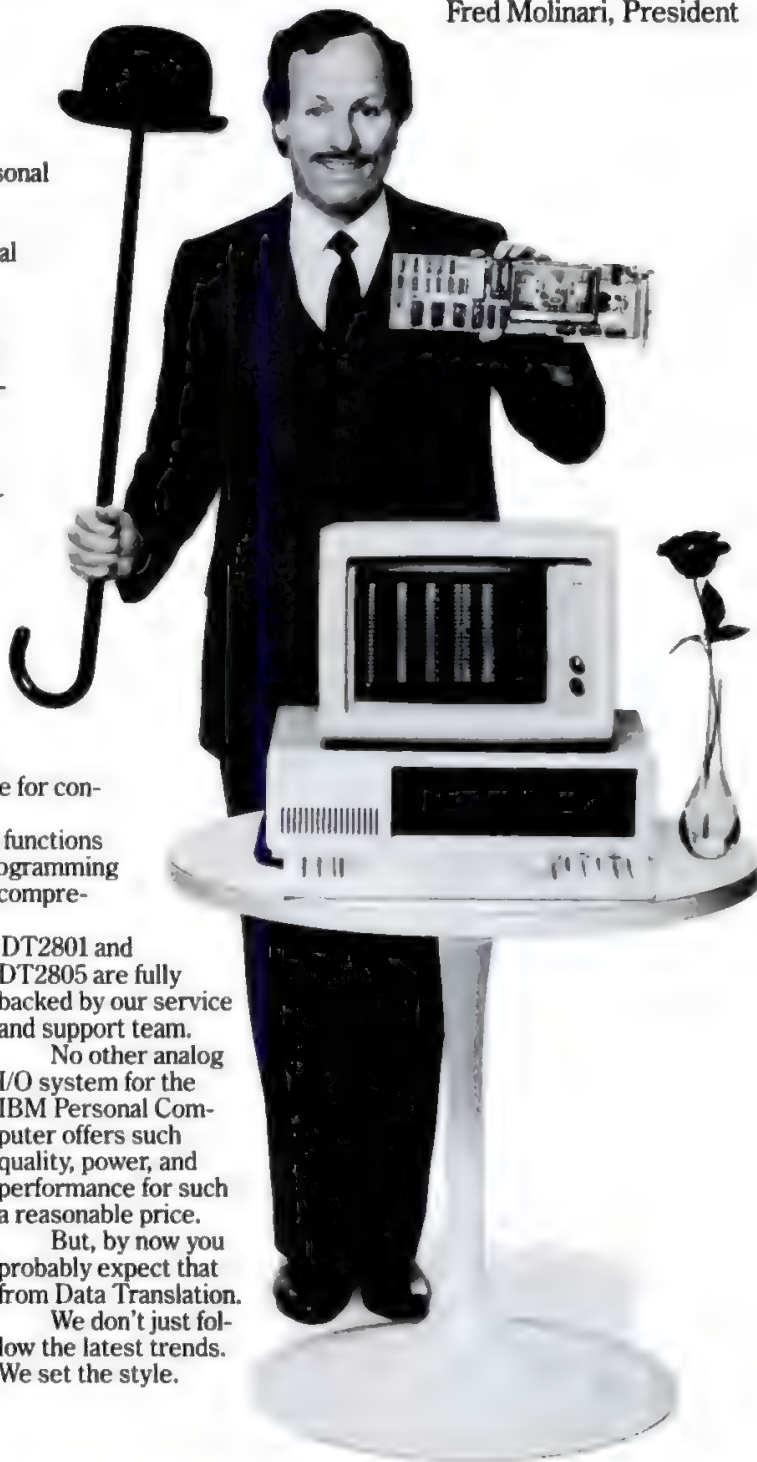
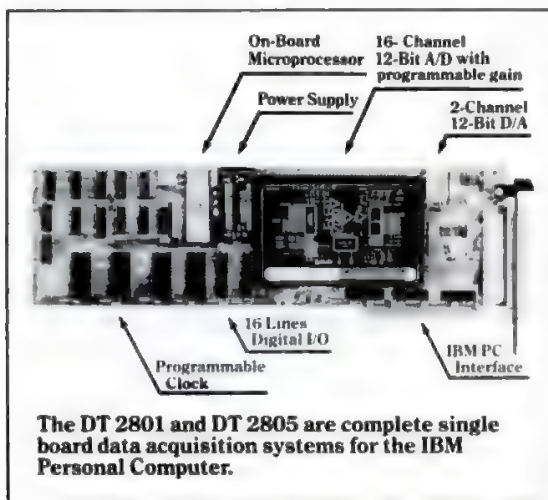
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## Smooth Operators

Microsoft held a seminar for the press recently, at which it described Xenix, its commercialized version of Unix. It is almost finished with revision 3, which should be available to its OEMs in June. A number of systems (PC's, Radio Shack, DEC, Victor, and Apple Lisa) were on display, all running Xenix. Radio Shack was running its already-released version and three machines were networked.

I was not overly excited by this news, since most of us have been expecting Xenix to pop up for some time. There were

three things about the seminar that really caught my attention.

The first was Microsoft's discussion of the "visual shell," its name for a program that sits between a user and the guts of the operating system. It allows a user to operate the system by pointing at things rather than spelling them out. This shell will be ready in June for both Xenix and MS-DOS 2.0 (translation: PC-DOS 2.0). That's important, and we should all be waiting to see what IBM does about this and how quickly the shell becomes available for the PC. My guess: IBM will announce the

shell as an add-on product to PC-DOS 2.0, available at additional cost. Assuming \$40, PC-DOS 2.0 with the shell would be a \$100 product.

Second, Jon Shirley, Vice President of Tandy's Computer Division, waxed enthusiastic about Xenix for the TRS-80 Model 16 during his presentation. He told the story of how Tandy was tempted into the land of evil, nonstandard, proprietary

**I**BM IS NOT  
in a position with the  
PC to effectively address  
the multi-terminal  
market.

operating systems, but was saved by the divine hand of Bill Gates.

I give the man credit: his switch to Xenix on short notice took guts, and it appears to have been successful. Although Jon would not give out specific numbers, Jean Yates told me that about 30,000 Model 16's have been installed, of which about 5,000 run Xenix. Very impressive. Jon did say that he thought every Model 16 running Xenix was multi-user, since the terminal cost was small compared to the total Model 16 price. I mention all this because IBM is not in a position with the PC to effectively address the multi-terminal market; I'm not sure the performance of the 8088 is up to it anyway. This gives Radio Shack a tremendous advantage over IBM in the small business market.

Third, and finally, the seminar was somewhat ragged around the edges. The demonstrations were not particularly exciting, nor were they effective in getting Microsoft's important points across. Attendance was light, something I attributed to the very late notice; I was invited on a Thursday for the next Tuesday. Most of the non-Microsoft speakers allowed that they had been recruited on very short notice. Esther Dyson (editor of the Rosen Electronics Newsletter) triggered the thought: Why did Microsoft hold the seminar? Was it a response to something, or an attempt to steal someone's thunder?

Time will tell.

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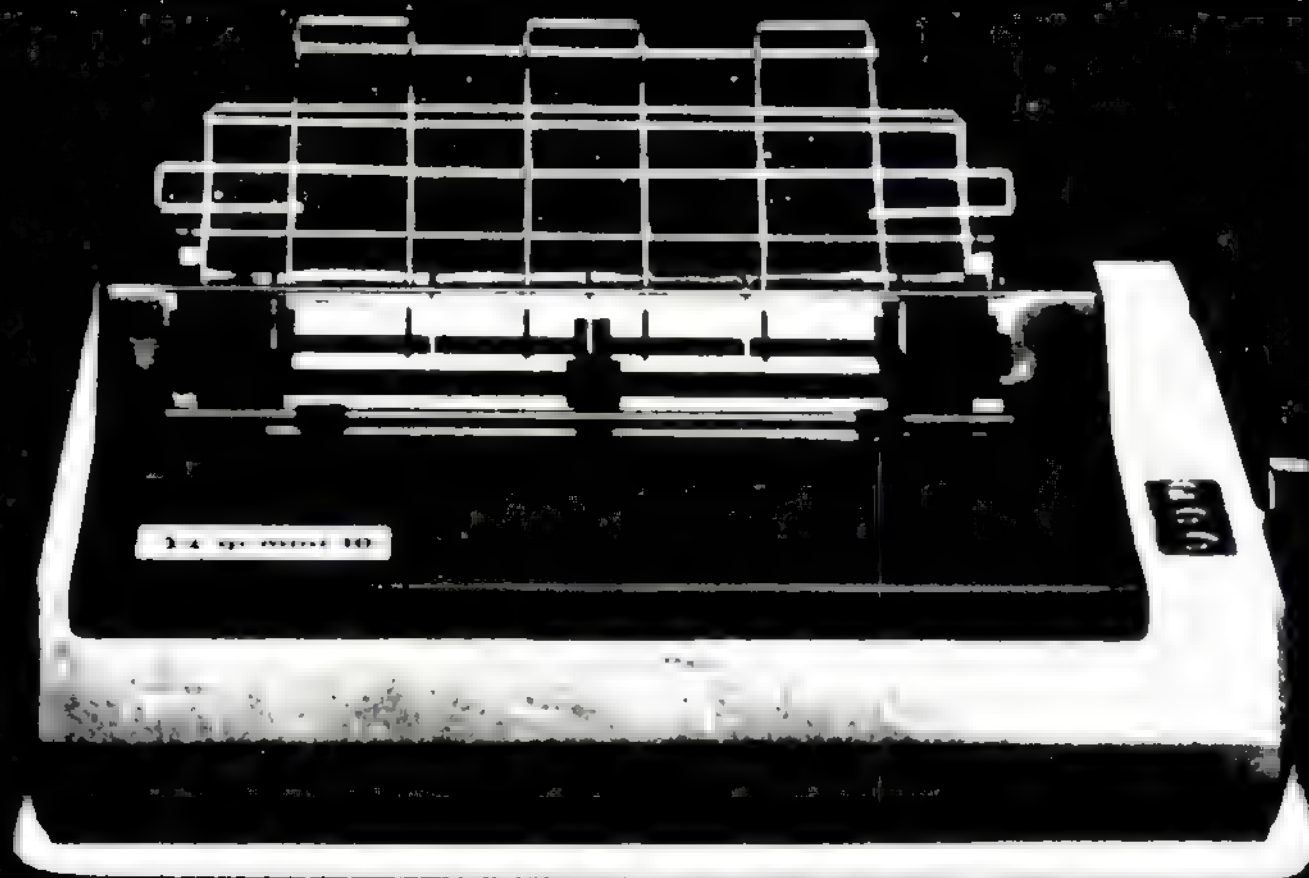
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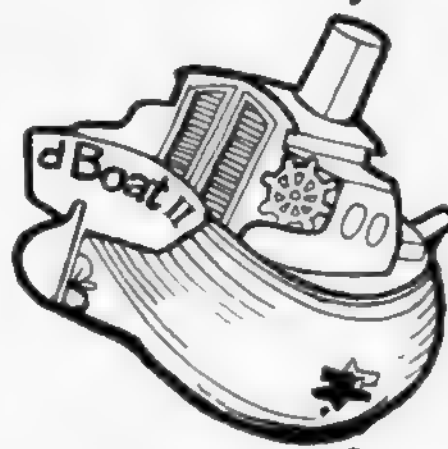


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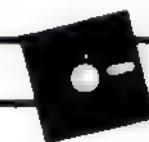
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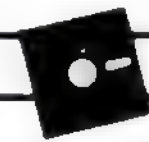
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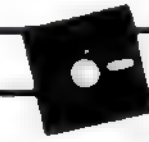
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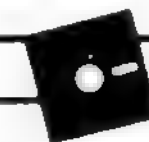
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# Software Breakthrough...

# NEW QUIKPRO + PLUS WRITES PROGRAMS FOR YOU IN MINUTES ON YOUR Micro

Technical Review  
by Wayne Hepburn

**QUIKPRO + PLUS** is a new breakthrough in software for microcomputers from ICR-FutureSoft.

Until now, whenever you wanted a new separate program in BASIC (Microsoft Basic/MBasic/Basic 80/Oasis Basic), you had to spend a lot of dollars for it, or a lot of hours creating it (if you have the know-how). That's all in the past now.

Anybody who can turn on a computer can write a program, quickly, with this new **Quikpro + Plus** software which generates programs for you. **Quikpro + Plus** is the invention of Joseph Tamargo of Florida. His brilliant approach to program writing allows you to tap the real power and speed of your microcomputer, and it is about time this happened.

I interviewed him to find out more about **Quikpro + Plus** and pass this valuable information to you. He told me "The best part of this software is that it gives you a separate custom program every time you use it. The resulting program is produced, error-free, in BASIC (Microsoft Basic/MBasic/Basic 80/Oasis Basic, as appropriate to your system) for you by **Quikpro + Plus**. What's more, you can list your new program, look at it, see what makes it tick, and modify it as you wish."

You can also, customize, enhance, alter, and even copy the programs you create with **Quikpro + Plus**. This is because programs created by **Quikpro + Plus** are structured, easy to follow, and include many REMARKS statements right in the program listing. I don't know of any other software with the flexibility and ease of use I found in **Quikpro + Plus**.

## HUNDREDS OF APPLICATIONS...

For Education, Business, Hobby, Home, Science, Personal, etc. a partial list includes programs like these: Financial Forecasting, Expense Planning, Data Access and Retrieval, Modeling, Record Keeping of all kinds, Statistical Data Banks, and much, much more. **Quikpro + Plus** cuts the time it takes to generate a new custom program down to a few minutes. That's true. I saw a

letter from a user who created a separate program in Basic within fifteen minutes after reading the clear, simple, complete Documentation & Operating Manual for **Quikpro + Plus**. The software will generate File Handling and Data Entry Programs in a file format, drawn right on the screen by user. Programs created by **Quikpro + Plus** produce standard ASCII Data Files allowing data to be easily accessed by other programs, other micro's, and even main frames.

## HOW IT WORKS...

The operation of **Quikpro + Plus** is simple and easy. On your screen you answer questions which appear in plain English. The answers generate error-free Filing & Data Entry Programs for you...instantly. This completely eliminates the tedious and time consuming development you normally go through to write a program. Since the instructions are right on the screen you don't need any programming skills to operate **Quikpro + Plus**. Quickly, you get a fully independent new program ready to run on your system. After you create the new program you can remove **Quikpro + Plus** and stick it on the shelf until the next time you create a custom program.

## PRINTS REPORTS & MANUALS...

There is a full report printing capability put into your new separate program by **Quikpro + Plus**. You can even print out in formats different from the File Format you used without altering the Record Data. Or you can selectively print portions of Files or selected fields from selected Records. Just about anything you want can be reported out from the Data Base associated with the new custom program you wrote.

## PERFORMS CALCULATIONS...

You can perform all manner of computations among various fields in each record. You can selectively calculate and print resulting data only, or Data Base and results, or alter Records by calculation results, and so forth. The possibilities seem unlimited. And keep in mind that the power and features I am talking about end up in the separate new custom program **Quikpro + Plus** writes for you.

This software is ready to ship immediately

and you can start writing programs the day you get in. In fact, ICR-FutureSoft guarantees your satisfaction or you can return it for a full refund in ten days after delivery. How's that for confidence? Mr. Tamargo said "There isn't any risk to us...our product works like it's supposed to work and users are very well satisfied. We are glad to guarantee satisfaction."

You get **Quikpro + Plus** by mail or phone directly from ICR-FutureSoft. Just write them, or call their Toll-Free phones and specify your model and version requirements from the list that follows:

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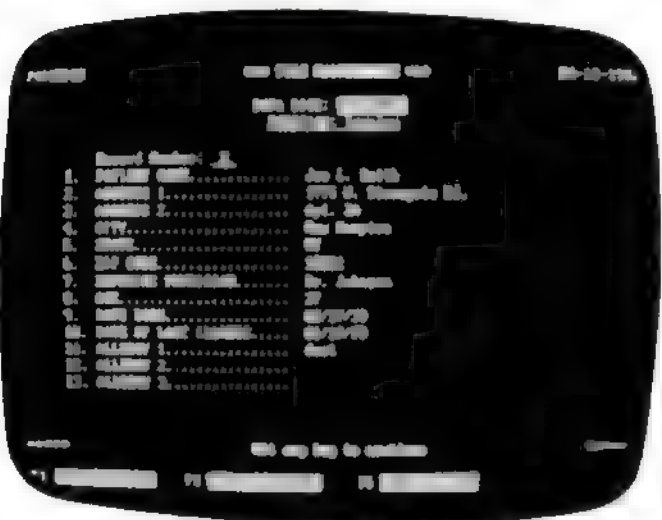




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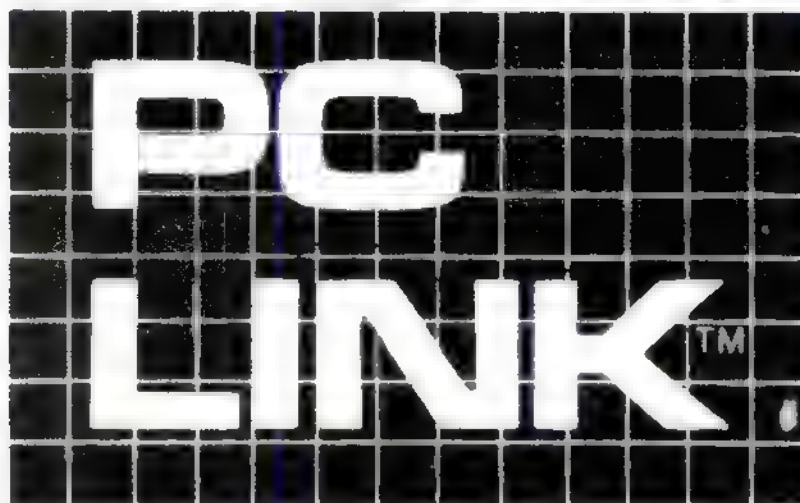
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# IBM PC GRAPHICS PRIMER, PART II

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In Part I of the IBM PC Graphics Primer, authors Christopher L. Morgan and Mitchell Waite described the PC color/graphics and monochrome adapters, explained medium and high resolution color modes,

and introduced plotting and drawing commands in Advanced BASIC. In Part II, they explore these applications further, providing sample programs to generate colorful screen graphics.

---

This chapter describes how to use the point, line, and circle plotting commands Pset, Preset, Line, and Circle, for simple to sophisticated applications. As opposed to Chapter 1, in which these commands were introduced in black and white in their simplest forms, this chapter presents these commands in the full glory of color with all their available options. Although

the "syntax" (format) of the four commands is simple enough, their variety of uses in applications is enormous. Thus, in order to prevent "overwhelm," we will start with some simple examples and build toward the more complex ones.

Once a firm grip of these ideas has been established, we will accelerate to more advanced uses of plot, line, and circle, concluding with pie and bar charts, and 2-D and 3-D graphs. For the grand conclusion, we present a program that draws a three-dimensional view of an object using data statements to define the picture. The program even hides those lines that should be hidden. In our case, we have



chosen to display a house, but you can use this same program to display many other 3-D objects with hidden lines. You will only have to change the data.

### The Commands

As we explain these graphics commands we will be showing a series of stand-alone example program segments. By stand-alone, we mean that although all of these examples are part of one big program, each segment can really be run by itself provided your machine is properly initialized.

## THE LOCATE command is extremely useful in graphics.

As we come to each example, we will give a small section of BASIC statements for you to type in. You should just add these to what you have already typed from the previous examples in this chapter. Please don't change any of the line numbers because we have designed each sample program so that it will not overlap with any other. As you work your way through the examples you will make a longer and longer program. If you wish to see the results from the beginning of the chapter up through the point where you are now, just type RUN. However, if you wish to see what you are working on at the moment, type GOTO followed by the line number at the beginning of that example. This last method will start the computer at the beginning of that particular example.

When you are finished studying this section and have entered all the examples, you will be able to RUN the program from start to end (by typing RUN) and see the results of all the examples in a kind of flash card review of what you have learned in this chapter.

Our first example is a program that you should use to set your machine up for the following examples in this section. It will also be used for the same purpose in following chapters. This short initialization program will form the first several lines of our program.

This short program puts the IBM PC into the medium resolution mode, sets the

background color to light red, and selects palette 1. It also turns off the function key

**WHEN YOU  
are finished studying  
this section you will be  
able to RUN the  
program from start to  
end and see the results  
in a kind of flash card  
review.**

display at the bottom of the screen and makes sure the screen is cleared.

```
130 REM INITIALIZATION
140 REM Put the IBM in medium
150 REM resolution with
    color.
160 REM
170 REM The background color
    is
180 REM light red and the
190 REM foreground colors are
200 REM chosen from palette 1
210 REM
220  SCREEN 1
230  COLOR 12, 1
240 REM
250 REM Clear the screen with
    keys off
260 REM
270  KEY OFF
280  CLS
```

Type it in and try it out. You should see a blank light red screen.

Our second example helps connect the sample program sections. It consists of a couple of subroutines. The first subroutine stops, asks you to press the Enter key if you wish to continue. It also calls another subroutine that puts a centered title on the top of the screen.

```
5000 REM SUBROUTINE - PAUSE &
    TITLE PAGE
5010 REM
5020  LOCATE 25, 1
5030  INPUT "Press ENTER to
    continue":A
5040  CLS
```

```
5050  GOSUB 5080
    REM centered title
5060  RETURN
5070 REM
5080 REM SUBROUTINE -
    CENTERED TITLE
5090 REM
5100  LOCATE
    1, (40-LEN(T$))/2+1
5110  PRINT T$;
5120  RETURN
5130 REM
300  T$ = "RED BACKGROUND"
310  GOSUB 5080 REM centered
    title
320 REM
```

Why don't you type all of this in it now. Please don't remove the statements you already typed in from the first sample.

Now run your program. You should get a red screen titled RED BACKGROUND. How is this for special effects?

Notice that the Locate command is used a couple of times. Although, strictly speaking, it is not a graphics command, it is extremely useful in graphics. This command positions an unseen "text cursor" to a specified row and column. This allows you to start printing text anywhere you want on the screen. Contrary to the usual procedure for graphics, row (y-position) comes before column (x-position) in this command. This is more natural for text (that is, line, column = y,x). Notice that the first Locate is used to put the message "Press Enter to continue" on the twenty-fifth row (line) of text. For this to work, you must turn off the display of function keys on the twenty-fifth line with the Key Off command (as you did in line 270 of the program). The second use of the Locate command is for centering a title contained in the string T\$. Here, the correct column to begin printing is computed by using the length of the string T\$ that contains the message. This computation is found within the Locate statement: You can use an expression for the row or column.

You might wonder why we have chosen to divide such simple work into two subroutines; surely one could do both functions. In the good old days of FORTRAN programming, there would have been one subroutine with two "entry" points; the second would be used if you just wanted to center the title. This is frowned upon now in the modern days of structured programming. Languages like



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### **Pset and Preset**

Pset and Preset are both used to plot points. Since every picture is made of points, it is possible to do all your graphics with these two commands. This is highly inefficient for a number of reasons. The most obvious reasons are speed of execution (how fast your program runs) and size of program (how much memory and/or paper it takes up). Equally important are speed of development (how long it takes to write your program) and ease of maintenance (how easy is it for you or somebody else to understand and modify your program). The version of BASIC you are using has some of the most powerful graphics commands available.

Now let's get down to details. The syntax (correct form) of the Pset and Preset commands is as follows:

```
PSET (x,y) [,color]
PRESET (x,y) [,color]
```

where (x,y) indicates the coordinates of the point and color specifies the color.

If the color is not specified (default color mode), Pset plots a point whose color is the foreground color and Preset plots a point whose color is the background color. In general, on a clear screen (background color screen), you use Pset to plot plots and Preset to erase points.



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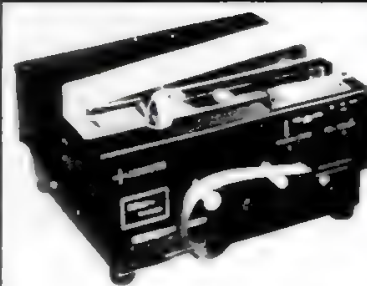
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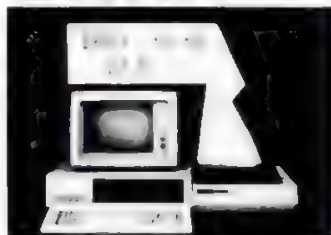
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The square brackets indicate that the color is optional. In fact, if the color is specified, Pset and Preset perform identically! That is, they both plot a point of the indicated color. Note that the square brackets include the comma that normally separates the color specification from the rest of the command. If you do not specify the color, then you'd better not type in this comma. (Otherwise, the computer will reach out and slap your hand.)

In the 320×200 medium resolution mode, at any one time there may be four colors, indicated by the numbers 0, 1, 2, and 3. These are what is called *logical* col-

ors. That is, how they "map" to actual colors depends upon other commands, namely the Color command, which was discussed in PC, Volume 1 Number 12.

The number 0 indicates the background color, and the number 3 the foreground color. The background color can be one of 16 possible colors and there are two palettes for colors 1, 2, and 3. In our examples we will use the Color statement to obtain different background and palette colors in the medium resolution mode.

In the 640×200 high resolution mode, there are two colors. These are specified by the numbers 0 and 1. The number 0

indicates the background color, which is always black; the number 1 indicates the foreground color, which is white. (On some monochrome screens, the foreground color will appear green or amber.) To further complicate the issue, in the high resolution mode, the number 2 acts the same as a 0, and a 3 acts the same as a 1. Thus, in this mode the background color is produced by both 0 and 2 and the foreground by both 1 and 3. All of this means that if the color is not specified, then the Pset and Preset commands will behave as shown in Figure 1.

Having explained what happens with the color of a point, let's discuss how a point is positioned on the screen—the (x,y) part. Coordinates are used to specify the location of points on the screen. The point (0,0) is at the top left corner. The x-values range from 0 to 319 or from 0 to 639, depending upon the resolution, and the y-values range from 0 to 199.

Coordinates can be specified in two different ways: absolute and relative. With the absolute mode, you give the actual screen coordinates of the point to be plotted, but with relative coordinates you give a change in coordinates. BASIC keeps track of a kind of unseen "graphic cursor" called the "current position." Each time a Pset, Preset, Line, or Circle command is

resolution	command with color not specified	equivalent commands when color is specified
medium	PRESET (x,y)	PSET (x,y),0 or PRESET (x,y),0
medium	PSET (x,y)	PSET (x,y),3 or PRESET (x,y),3
high	PRESET (x,y)	PSET (x,y),0 or PRESET (x,y),0
high	PSET (x,y)	PSET (x,y),1 or PRESET (x,y),1

Figure 1: Default colors for Pset and Preset.

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employed, the current position is updated with the new position. With the Pset or Preset commands, the current position is updated to the point that you are plotting. More precisely, with a Pset or Preset command, coordinates in absolute mode become the coordinates of the new current position, and a point is plotted there. In contrast to this, coordinates in relative mode are added to the current position, giving the new current position, which is then plotted.

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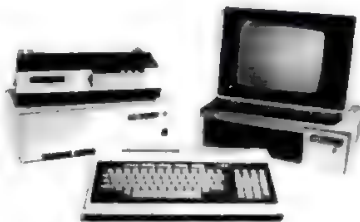
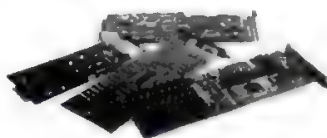
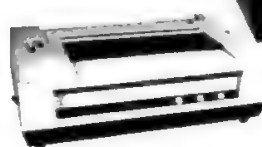
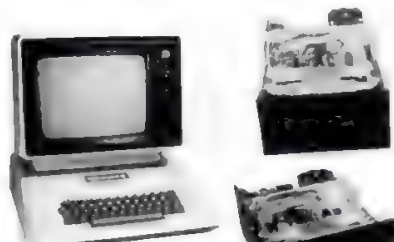
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before the coordinates in the command line. If it's there, then you are using relative coordinates; otherwise, you are using absolute coordinates.

Both of the Pset and Preset commands will plot a point. Whether it's seen or not depends upon its color and the color of the surrounding points. It is interesting to note that there is no simple command, such as Move, that just updates the current position.

For an example of how to use the point plotting commands, take a look at the program below.

This short program plots a cross of points in the center of the screen, using both absolute and relative coordinates and Pset and Preset commands.

```
330 REM POINTS ON THE SCREEN
340 REM
350 T$ = "POINTS ON THE
    SCREEN"
360 GOSUB 5000 REM pause
    & title
380 PRESET (159,100)
390 FOR I = 1 TO 10
400     PSET STEP(4,0)
410 NEXT I
420 REM
430 PRESET (159,100)
440 FOR I = 1 TO 10
450     PSET STEP(-4,0)
460 NEXT I
470 REM
480 PRESET (159,100)
490 FOR I = 1 TO 10
500     PSET STEP(0,4)
510 NEXT I
520 REM
530 PRESET (159,100)
540 FOR I = 1 TO 10
550     PSET STEP(0,-4)
560 NEXT I
570 REM
```

When this example runs, you will see a number of points plotted forming the pattern of a cross. You cannot see the center point of the cross because it is the same color as the background.

Notice how we invoke our "pause & title" subroutine at the beginning of the program segment. You can see that the line that defines T\$ (line 350) can serve as documentation for this segment!

Now look at the graphics commands. The first command is a Preset (line 380). Since there is no Step, the coordinates are in absolute mode. Thus, it will plot a point

at (159,100), that is, a point whose x-coordinate is 159 and whose y-coordinate is 100 (x-coordinate always comes first with graphics commands). Since the Preset command plots a point whose color is the background color and since the point (159,100) already is the background color, you will not see this point. Consequently,

---

## ***T**HE VERSION of BASIC you are using has some of the most powerful graphics commands available.*

---

the main purpose of this command is to set the current position. The IBM PC "default value" for the current position is (160,100), but do not normally count on this default position; it is only good right after you have cleared the screen.

You see that after the first graphics command, the current position is (159,100). Next you have a FOR loop that runs the Pset command ten times. This Pset (line 400) has a STEP before the coordinates and thus is in relative mode. Adding its coordinates (4,0) to the current position (159,100) gives a new current position of (163,100). Since this is the foreground-producing Pset command, you will see the point as a white dot on the screen. It appears white because we have chosen palette number one in the Color statement (foreground is white). Each time around the FOR loop, the Pset command moves the point by the same amount. You see a total of ten dots equally spaced to the right of the center point of the screen. They are all white because we use the same Pset command each time. Following this FOR loop are three more FOR loops, which draw the other arms of the cross.

It is interesting to note that if the default position of (160,100) were used instead of our Preset position (159,100), the white dots would be very hard to see without using an RGB color monitor. We have seen that with a red background, white dots should be drawn only on odd-numbered x-coordinates. This is why we start with an odd number, 169, and increment or decrement by an even number,

namely 4. This way we get x-coordinates 159, 163, 167, and so on (moving to the right) or 159, 155, 151, and so on (moving to the left).

Relative coordinates are sometimes handy if you have a certain shape such as a marker, icon, or machine part that you wish to place at various spots on the screen, or if you want to "vector" along the boundary of a figure. For example, if you are trying to draw a room, it is often easiest to deal with the length and direction of each wall than it is to deal with their absolute coordinates because the "algorithm" for actually measuring a room consists of measuring the length of each wall and noting its direction.

In the next subsection you will extend your graphics capabilities to drawing lines. Commands to draw lines are much more plentiful in graphics programs than commands to plot points. While we discuss lines we will also see more examples of the various forms of the point plotting commands.

### **Line**

As indicated by its name, the Line command is used to draw lines, but it is actually useful for much more than that. In this

---

## ***R**ELATIVE coordinates are sometimes handy if you have a certain shape that you wish to place at various spots on the screen.*

---

section we will show how to use it to draw unfilled and filled boxes. We will continue to use our short stand-alone program sections to build in stepwise fashion confidence and knowledge about the effective use of this command. The full syntax for the LINE command is:

```
LINE [(x1,y1)] - (x2,y2)
[,[color] [,B[F]]]
```

Look at all those square brackets! They all indicate various levels of options. Let's start with one of the simplest cases:



LINE (x1,y1) - (x2,y2)

Here (x1, y1) are the coordinates of the beginning point of the line and (x2,y2) are the coordinates of the end point of the line. That is, this command will cause a line to be drawn from (x1,y1) to (x2,y2).

The color is not specified. In this case it will use the foreground color just as described above for the Pset command. That is, we will see color 3 if in medium resolution and color 1 if in high resolution. In the medium resolution mode, color 3 can be either white or yellow

depending upon the palette number that is set in the Color command.

Both sets of coordinates for Line can be expressed in either absolute or relative (STEP) mode.

The example below illustrates this simple form of Line command. Notice that this example sizes up the screen by using up the full range of values for x and y in the medium resolution mode.

This short program draws diagonal lines across the screen using the simple form of the LINE command in which both end points are specified.

590 REM LINES ACROSS THE SCREEN

600 REM

610 TS = "LINES ACROSS THE SCREEN"

620 GOSUB 3580 :REM pause & title

630 REM

640 REM Draw some lines across the screen

650 REM

660 LINE (0,0) - (319,199)

670 LINE (0,199) - (319,0)

680 LINE (0,100) - (319,100)

690 LINE (160,0) - (160,199)

When you run this example you will see four lines that run all the way across the screen in different directions: two

**C**OMMANDS TO draw lines are much more plentiful in graphics programs than commands to plot points.

diagonally, one horizontally, and one vertically. If you are using an NTSC monitor or TV you may have difficulty seeing the vertical line because its color is white and it lies entirely on even-numbered pixels.

The next three examples of the Line command have no pauses between them. They will all appear in one picture.

First, however, add some color to your syntax for the Line command:

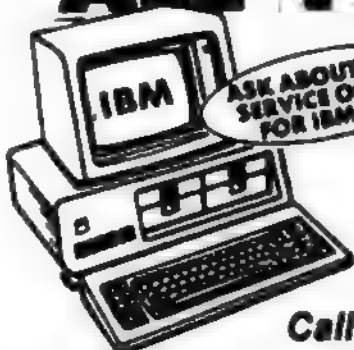
LINE (x1,y1) - (x2,y2), color

Here, color can be a number from 0 to 3 following the rules described above the Pset (and Preset) command(s). It is better to relate the Line command to the Pset commands as both of them have the same default behavior with regard to color. The next example shows how to draw a rectangle with this form of the Line command.

This program draws a rectangle in which each side is a different color, using the Line command.

720 REM RECTANGLES

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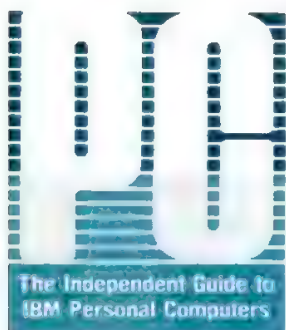
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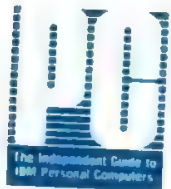
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```

730 REM
740 TS = "RECTANGLES"
750 GOSUB 3580 :REM pause
    & title
760 REM
770 REM FIRST THE HARD WAY
780 REM
790 REM This is a sequence of
    four lines.
800 REM
810 LINE (51,50) - (101,50) ,
    0
820 LINE (101,50) -
    (101,150) , 1
830 LINE (101,150) -
    (51,150) , 2
840 LINE (51,150) - (51,50) ,
    3
850 REM

```

When this program runs, you will see a rectangle appear on the left third of your screen. Each side of the rectangle is a different color. Notice that the first side is not visible because it is the same color as the background. Absolute coordinates are used each time the Line command is used.

Now let's explore how to use the Line command with only the second set of coordinates specified. This uses the idea of current position, which was introduced

ples, we will continue to use absolute coordinates, but later we will use relative coordinates. Again, the difference between these modes is indicated by the presence or absence of the keyword: Step. In the following example, you will march around the rectangle using absolute coordinates (no Step), providing only the new current position each time. Notice that the Pset command is used to set the current position before the Line commands start drawing the sides.

This program draws a rectangle using current position and the form of the Line

command in which the first pair of coordinates is omitted.

```

860 REM AN EASIER WAY
870 REM
880 REM This is a sequence of
    four lines
890 REM using the current
    position.
900 REM
910 PSET - (151,50)
920 LINE - (201,50) , 1
930 LINE - (201,150) , 2
940 LINE - (151,150) , 3

```

**T**HE LINE command to the Pset commands has the same default behavior with regard to color.

in the discussion of Pset and Preset earlier. The syntax for this form is:

LINE - (x2,y2) [,color]

As you can see, the color is optional. This command causes a line to be drawn from the current position to the point specified by the coordinates (x2,y2). The current position is updated to the end of the line (coordinates (x2,y2)). The current position is always updated in this way whatever form of the Line command is used.

Either absolute or relative coordinates can be used. In the next couple of exam-

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```
950 LINE - (151,50), 2
960 REM
```

Now let's see how to draw a rectangle with only one graphics command. This uses the Box option of the Line command. The syntax is:

```
LINE [(x1,y1) -
(x2,y2), [color], B
```

This draws a rectangle whose sides are parallel to the sides of the screen and whose x values are between the x-coordinates x1 and x2 and whose y values are between y-coordinates y1 and y2. As you can see, the first coordinate and the color are optional—they are in brackets. If the first coordinates are not specified, the current position will be used instead. If the color is not specified, the foreground color will be used.

Now, let's look at the coordinates more closely. As we just saw, a rectangle whose sides are parallel to the sides of the screen can be described as a set of points (x,y) such that x is between values x1 and x2

and y is between values y1 and y2. Actually, this describes a solid box. Using a two-dimensional notion of "between," we could say instead that this box is the set of all points (x,y) that are between points (x1,y1) and (y1,y2). The rectangle is the boundary of this box, and the points (x1,y1) and (x2,y2) form a pair of opposite corners for the rectangle.

In the example that follows, we show how to draw such a rectangle in one graphics statement. Notice that both pairs of coordinates are specified, the color is not specified (a place is held for it by the commas), and the B is used to specify a "Box." Thus, a rectangle is drawn in the foreground color.

The following program draws a rectangle in one graphics command, using the Box option.

```
990 REM A BOX IN JUST ONE
STATEMENT AND ONE COLOR
1000 REM
1010 LINE (251,50) -
(301,150), , B
```

The next example shows how to use the Line command to draw lots of random rectangles quickly. The RND function is used to generate random numbers. The RND function in BASIC generates "pseudo random" numbers between 0 and 1. That is, it produces a sequence of numbers between 0 and 1 that "behaves" like a sequence of random numbers—even though the computer has a very definite set of rules for producing this sequence.

**P** I IS ONE  
of those numbers that  
can never be totally  
accurately specified by a  
decimal (or binary)  
number.

The program draws lots of rectangles randomly positioned and sized.

```
1040 REM RANDOM COLORED RECT-
ANGLES
1050 REM
1060 TS = "RANDOM COLORED
RECTANGLES"
1070 GOSUB 3580 REM pause
& title
1080 REM
1090 REM Here we use relative
1100 REM coordinates and
random numbers.
1110 REM
1120 COLOR 0,0
1130 REM
1140 FOR I = 1 TO 50
1150 X = 250*RND :
Y = 10+110*RND
1160 U = 70*RND :
V = 50*RND
1170 C = 3*RND + 1
1180 LINE (X,Y) -
STEP(U,V),
C, B
1190 NEXT I
1200 REM
```

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CIRCLE 310 ON READER SERVICE CARD

Each parameter of the Line statement (line 1010 of our program) is controlled by a separate variable that is randomly generated. Notice that relative mode is used for



the second coordinates (x2,y2). This has the effect of controlling the width and height, and hence, the size of the rectangle. The variable *U* controls the width, and the variable *V* controls the height. The way *U* and *V* are generated with the RND function guarantees that the width will not be any greater than 70 and the height

## **T** RIGONOMETRIC functions are very handy in graphics.

will not be greater than 50. This is to make sure that none of the rectangles will extend beyond the boundaries of the screen. The variables *X* and *Y* control the position of the rectangle (actually the upper left corner of the rectangle). *X* must be between 0 and 250 and *Y* must be between 10 and 120. Each rectangle goes from (*X*,*Y*) to (*X*+*U*,*Y*+*V*). This means that the rectangles fit within an area on the screen whose x-coordinates range between 0 and 250+70=320 and whose y-coordinates range between 10 and 120+50=170. Therefore, the full width of the screen can be filled, but the height is restricted to allow messages at the top and bottom of the screen. Notice that even the color of the rectangle is randomly generated. We have set the background to black and selected palette 0. This makes the foreground color brown.

It is possible to use the Line command to fill rectangles, too. The syntax is:

```
LINE [(x1,y1)] - (x2,y2),  
[color],BF
```

Here the letters *BF* at the end stand for *Box Fill*. You might try modifying the previous example so that the boxes are filled in.

Now let's change pace, and while we are at it, change the color to light blue. First we draw a single triangle. Here the number of colors matches nicely with the number of sides—three colors for three sides. We use absolute coordinates (no Step). This "fixes" the position of the triangle. In the next example, we will use relative coordinates that will allow us to place the triangle anywhere we want on the screen.

This short program draws a single right

triangle, using absolute coordinates.

```
1390 REM RIGHT TRIANGLES
1400 REM
1410 T$ = "RIGHT TRIAN-
      GLES"
1420 GOSUB 3580 :REM pause
      & title
1430 COLOR 9, 1 :REM change
      color
1440 REM
1450 REM Here we use absolute
      coordinates
1460 REM
1470 LINE (21,100) -
      (71,0), 1
1480 LINE - (71,100), 2
1490 LINE - (21,100), 3
1500 REM
```

On the same screen let's use relative coordinates to draw a set of triangles all in a line. Notice that the (absolute) coordinates in the Pset command are given by expressions. This is perfectly legal and a very powerful technique. Notice also that relative coordinates are used for the three

Line statements that draw the sides of the triangle. Because only constants are used in these line statements, the triangles all have the same size and shape.

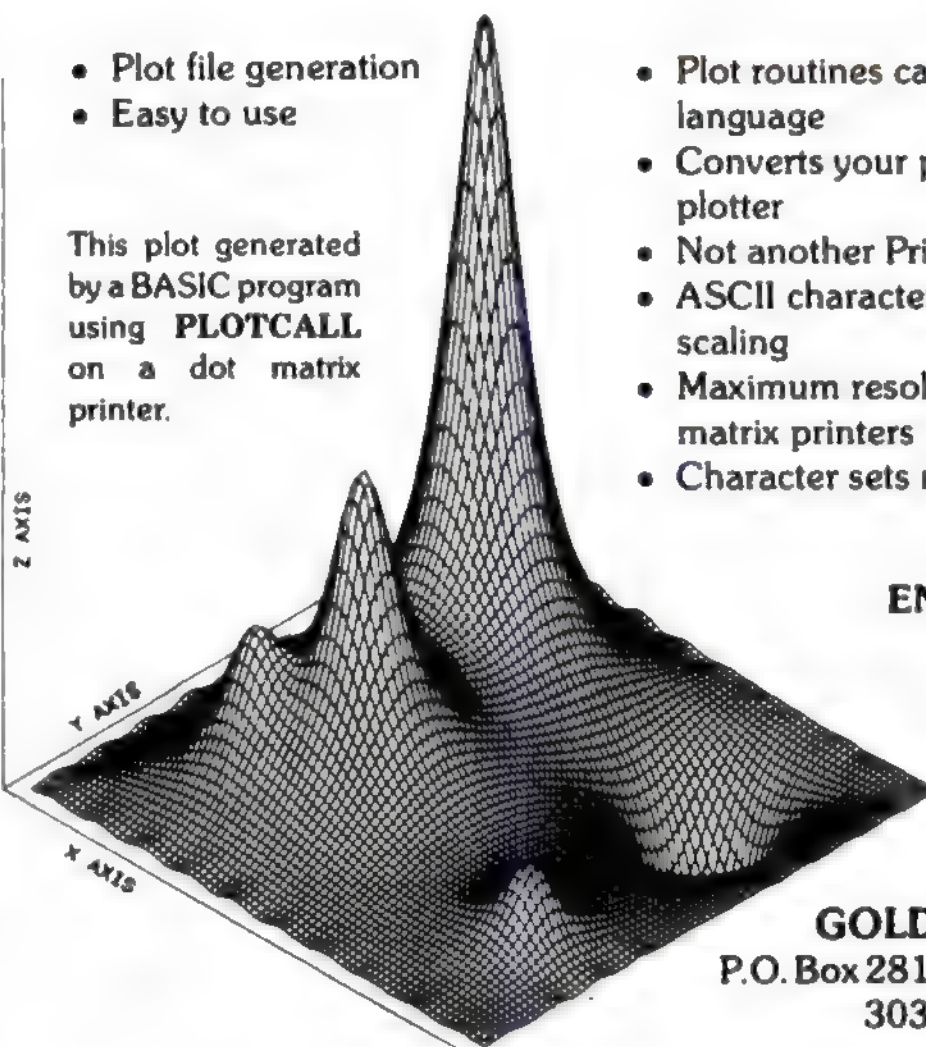
```
1510 REM Now we use relative
      coordinates
1520 REM and make lots of
      them.
1530 REM
1540 FOR T=0 TO 100 STEP 5
1550   PSET (30+2*T,200-T)
1560   LINE -
      STEP(50,-100), 1
1570   LINE - STEP(0,100),
      2
1580   LINE - STEP(-50,0),
      3
1590 NEXT T
1600 REM
1610 REM
```

Now let's make some regular figures that eventually will lead to some circles. Since this is a different topic, we also change the background color. This time we call for a yellow background.

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CIRCLE 247 ON READER SERVICE CARD



Write a short program that draws a regular pentagon. Solution:

```
1620 REM REGULAR POLYGONS
1630 REM
1640 TS = "REGULAR POLY-
      GONS"
1650 GOSUB 3580 :REM pause &
      title
1660 COLOR 14, 1 :REM change
      color
1670 REM
1680 REM PENTAGON
1690 REM
1700 PI
```

```
3.141592653589793#
1710 AO = 2*PI/5
1720 R = 45
1730 REM
1740 PRESET (60+R,100)
1750 REM
1760 FOR A = 0 TO 2*PI STEP
      AO
1770 X=R*COS
      (A):Y=R*SIN(A)
1780 LINE
      (60+X,100+Y)
1790 NEXT A
1800 REM
```

The program is very general and with only one change (line 1710), it will draw a regular polygon of any given number of sides. A polygon is a closed figure made up of line segments. Triangles, squares, rectangles, trapezoids, pentagons, and hexagons are all examples of polygons.

Notice that we have defined Pi in line 1700. The # at the end indicates double

**A** PROGRAMMER will often start with an old program and modify it so that it performs new wonders.

precision. This much precision is entirely unnecessary, but nonetheless fun! (if you like this kind of thing). Actually, Pi is one of those numbers that can never be totally accurately specified by a decimal (or binary) number.

The variable AO (defined in line 1710) is the Step size for the FOR loop that draws the figure. By changing this Step size, you change the number of sides of the figure. Note that the Step in the FOR loop is used differently than the key word Step that is used to indicate relative coordinates. In line 1720, a radius R is defined; It is the radius of a circumscribing circle around the polygon.

The first plotted point of the figure is set with the Preset command on line 1740. If you don't do this, you will get an ugly line across your screen.

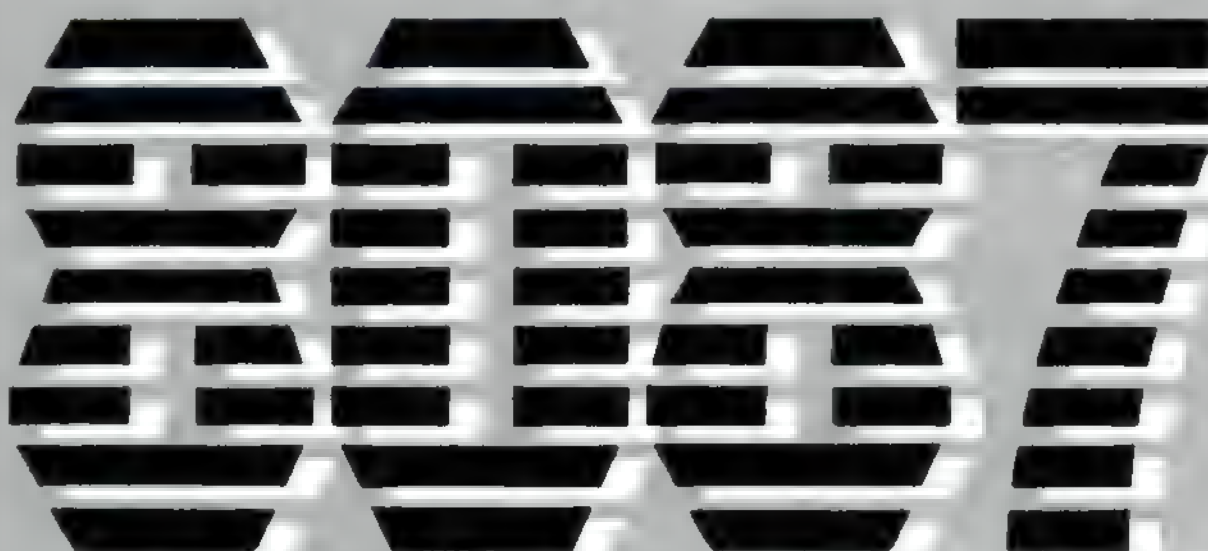
The FOR loop starts on line 1760. The index of the loop is A, which stands for angle. We are using radian measure, so the angle 0 is the beginning of the circle and the angle 2\*PI is a complete 360 degrees around the circle. The step size has already been discussed; it determines the number of sides.

On the 1770 we use some trigonometric functions. If you are unfamiliar with or afraid of such functions, this is a good way to get to know and love them. They become very handy in graphics. The formulas:

$$X = R * \cos(A)$$

$$Y = R * \sin(A)$$

which appear in line 1770 are quite useful. Given that (X,Y) are Cartesian coordi-



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CIRCLE 258 ON READER SERVICE CARD



nates of a point on a circle whose center is at the origin, then these formulas give X and Y in terms of the radius R and the angle A (see the sample program below). The R and A are actually the polar coordinates of the point, and these formulas are actually the transformation from polar to Cartesian coordinates.

To draw the sides we use the Line (line 1780) command in absolute coordinates with current position. Note the coordinates are simple expressions of the X and Y variables. These expressions help place the figure in the correct spot on the screen. Later we will discuss the topic of positioning or "mapping to the screen" in more detail. The FOR loop ends on line 1790.

The next example is almost identical to the previous one. Only lines 1680, 1710, 1740, and 1780 are different. Why don't you List lines 1680 to 1800 on your screen and change the line numbers so that they go from 1810 to 1930? Then change your new lines 1810, 1840, 1870, and 1910 as indicated in the listing. This will cause the new figure to be drawn with six sides and in the center of the screen (\* indicates changed lines).

```
*1810 REM HEXAGON
1820 REM
1830 PI = 3.1415926535#
*1840 A0 = 2*PI/6
1850 R = 45
1860 REM
*1870 PRESET (160+R,100)
1880 REM
1890 FOR A = 0 TO 2*PI STEP
A0
1900 X=R*COS
(A):Y=R*SIN(A)
*1910 LINE -
(160+X,100+Y)
1920 NEXT A
1930 REM
```

To get the third figure, edit your previous program and change the appropriate lines (see the sample program below). Now it is relatively easy to generate all these nearly identical program segments. It turns out that lots of programs are "grown" in a similar way. That is, a programmer will often start with an old program and modify it so that it performs new wonders. This approach actually saves quite a bit of time. Of course in real life, the resulting programs usually end up

looking quite different from their ancestors (\* indicates changed lines).

```
*1940 REM HEPTAGON
1950 REM
1960 PI = 3.1415926535#
*1970 A0 = 2*PI/7
1980 R = 45
1990 REM
*2000 PRESET (260+R,100)
2010 REM
2020 FOR A = 0 TO 2*PI STEP
A0
2030 X=R*COS
(A):Y=R*SIN(A)
```

```
*2040 LINE -
(260+X,100+Y)
2050 NEXT A
2060 REM
2070 REM
```

### Circle

Not to run you around in circles, the Circle command actually does much more than its name implies. It also draws arcs and ellipses, providing a quick way to construct curved shapes. This allows you to construct complicated pictures with less effort.

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CIRCLE 441 ON READER SERVICE CARD



The full syntax for the CIRCLE command is:

```
CIRCLE (xcenter,ycenter),
radius[,color[,start,end
[,aspect]]]
```

Here is another place where "overwhelm" occurs—even more square brackets than for the full syntax of the Line command! Let's slow down and first try to draw a

plain old circle. The syntax for this simpler case is:

```
CIRCLE (xcenter,ycenter),radius
where xcenter and ycenter are the x- and
y-coordinates of the center of the circle,
and radius is the radius of the circle. Here
we can see that the x- and y-coordinates of
the center and the radius are all specified.
The quantities xcenter, ycenter, and radi-
```

us can all be expressions. Either absolute or relative coordinates can be used for the center.

The following program segment illustrates this form of the command. The coordinates of the center and the radius are all constants in this example. In later examples we will use more complicated expressions.

```
2780 REM CIRCLE
2790 REM
2800 TS = "CIRCLE - THE
      EASY WAY"
2810 GOSUB 5000: REM pause
      & title
2820 REM
2830 REM Here is the easy way
2840 REM to make a circle.
2850 REM
2860 CIRCLE (160,100), 60
2870 REM
2880 REM
```

When this program runs, it produces a circle in the center of the screen. The circle is somewhat flattened. This flattening varies from screen to screen. We will see how to fix this soon.

We should note that in all forms of the Circle command, the current position is always updated to be the center of the circle, not the last point drawn on the figure.

Now let's explore the world of arcs. Many graphics systems don't have a circle statement, let alone an arc statement. In those systems you would have to do things the hard way. That's what we will do in the next example. Once you see this, you will appreciate the power of the Circle command.

The program that follows uses trigonometric functions—in a way similar to what was done in connection with drawing polygons. Instead of actually drawing arcs, it draws spanning sections of 30-sided polygons. With the medium screen resolution we use, you cannot tell the difference between this and a true circular arc. In our program we have again included a timer so that you can compare this method with a much easier and faster method that will follow.

This program draws ten arcs, which all start at the center of the screen, but belong to different circles. We won't explain the devious decisions we made to get this program working in as few steps as possible.

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You are welcome to study the listing yourself. Notice that this program has a very important ingredient: Fudge. Because of rounding off errors, FOR loops with real indices do not always execute the very last case; hence, a fudge factor, which is called, naturally enough, FUDGE.

The program uses trigonometric functions and the Line command to draw the figure, and the computer's clock to time the program.

```
2890 REM MAKING ARCS - THE HARD
    WAY
2900 REM
2910 TS = "ARCS - THE HARD
    WAY"
2920 GOSUB 5000 :REM pause
    & title
2930 REM
2940 REM This uses trigo-
    nometric
2950 REM functions.
2960 REM
2970 PI = 3.1415926535#
2980 AO = 2*PI/30
2990 R = 40
3000 FUDGE=.01
3010 REM
3020 TIMES="00:00:00"
3030 FOR EO=0 TO
    2*PI+FUDGE
    STEP PI/5
3040 REM
3050 PRESET (160,80)
3060 REM
3070 FOR A = EO TO -FUDGE
    STEP -AO
3080 X=R*COS
    (A)-R*COS(EO)
3090 Y=R*SIN
    (A)-R*SIN(EO)
3100 LINE -
    (160+X,80+Y)
3110 NEXT A
3120 REM
3130 NEXT EO
3140 REM
3150 LOCATE 3,1
3160 PRINT "time elapsed:
    ";
    TIMES$
3170 REM
3180 REM
```

Now we will see how to make arcs using the CIRCLE command. An arc has a starting angle as well as an ending angle (in radians).

To make an arc, just tack the starting angle and ending angle onto the end of the

CIRCLE command, and voilà: an arc. The syntax is as follows:

CIRCLE (xcenter,ycenter),  
radius,color,start,end

where start is the starting angle and end is the ending angle (in radians).

In the example program below, we draw the same number of arcs as in the

previous program. The positions are different in this program, but the programs are comparable because the arcs are of the same lengths as in the previous program. We have also put a timer on this program so that you can compare the speed of execution with the last program. You can see from the time output of the program that it runs significantly faster—about 15 times

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CIRCLE 365 ON READER SERVICE CARD



faster. It is also much easier to understand. For example, there is only one FOR loop, and the Circle command takes care of what was the old inner FOR loop.

Looking more closely at the program, we see that the arcs are produced by the Circle statement on line 3330. The center (X,Y) of this circle is recomputed each time through the remaining FOR loop. The trigonometric functions in the FOR loop cause this center to rotate about the center of the screen, thus spicing up the picture. The radius R for each arc is always the same, and the color is also always the same, namely 3. Each arc always starts at an angle of 0 radians, but each arc is longer than the previous one.

Actually, we could have eliminated the color parameter, but we must still have the commas that mark its place in the command.

```
3190 REM ARCS - USING CIRCLE
3200 REM
3210 TS = "ARCS - USING
      CIRCLE"
```

```
3220 GOSUB 5000 :REM pause
      & title
3230 REM
3240 REM this uses the circle
      statement.
3250 REM
3260 PI = 3.1415926535#
3270 R = 40
3280 REM
3290 TIMES="00:00:00"
3300 FOR EO = 0 TO 2*PI+.01
      STEP PI/5
3310 Y = 100 - R*SIN(EO)
3320 X = 160 + R*COS(EO)
3330 CIRCLE (X,Y), R, 3,
      0, EO
3340 NEXT EO
3350 REM
3360 LOCATE 3,1
3370 PRINT "time elapsed:
      "; TIMES
3380 REM
3390 REM
```

In the above example all angles are nonnegative. The Circle command does

something special if the angle is negative; namely, it draws a radius. We will explore this later when we present a sample applications program which draws pie charts.

The last example in our "stand-alone" series shows how to squash or round out circles. The last parameter in the Circle command is called the aspect ratio. It is the ratio of the radius in the x-direction to

**M**ANY  
graphics systems don't  
have a circle statement,  
let alone an arc  
statement.

the radius in the y-direction. When we change this quantity on the Circle command circle, we get an ellipse.

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If the aspect ratio is less than one, then the radius in the x-direction is equal to radius (as specified in the command) and the radius in the y-direction is equal to radius\*aspect. If, on the other hand, the aspect ratio is greater than one, the radius in the x-direction is equal to radius/aspect and the radius in the y-direction is equal to radius. The sample program for ellipses (following) illustrates these rules. This scheme guarantees that radius (the specified radius) is always the maximum radius of the figure.

The sample program also illustrates the rules for aspect ratio. It has a FOR loop that steps through values for Aspect from 0 to 9 by every tenth. If Aspect is less than 1, then the color is equal to 1 (cyan), and if Aspect is greater than or equal to 1, the color is equal to 2 (magenta). Thus, you can separate the cases as the figure is drawn. As the picture unfolds you will first see bluish (cyan) ellipses, which are all the same horizontal (x-direction) radius, but are flattened vertically (y-direction). These have an aspect ratio that is

less than one. Next you will see purplish (magenta) ellipses, which are all the same vertical radius (y-direction), but are squooshed horizontally (x-direction). These have the aspect ratio greater than or equal to one. All ellipses fit within the same circular region. Notice that the arc-making parameters in the Circle statement (line 3520) are absent, but their places are held by commas.

At the end of the program, we put a Locate statement (line 3550). This is to place the cursor out of the way when the program stops.

This program produces ellipses. If the aspect ratio is less than 1, the ellipse is drawn in cyan. If the aspect ratio is greater than 1, the ellipse is drawn in magenta.

```
3400 REM ELLIPSES
3410 REM
3420 TS = "FAMILY OF EL-
      LIPSES"
3430 COLOR 0,1
3440 GOSUB 5000 :REM pause
      & title
```

**A CIRCLE**  
will never appear  
perfectly round for all  
displays.

```
3450 REM
3460 REM This shows what you
      can
3470 REM do with the aspect
      ratio
3480 REM
3490 PI = 3.1415926535#
3500 FOR ASPECT = 0 TO 9
      STEP .1
3510 IF ASPECT<1 THEN
      C=1 ELSE C=2
3520 CIRCLE
      (160,100),60,
      C,,,ASPECT
3530 NEXT ASPECT
3540 REM
3550 LOCATE 23,1
```

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## Further Reading

David Rodgers and J. Alan Adams, *Mathematical Elements For Computer Graphics*, McGraw-Hill, 1976.

Willman Newman and Robert Sproull, *Principles Of Interactive Computer Graphics*, second edition, McGraw-Hill, 1979.

J. D. Foley and A. Van Dam, *Fundamentals Of Interactive Computer Graphics*, Addison Wesley, 1982.

David Fox and Mitchell Waite, *Computer Animation Primer*, Byte Books, 1982.

3560 END

3570 REM

In the IBM PC there is a "default value" given to the aspect ratio when nothing is specified in the Circle statement. This default value depends upon whether you are in the medium or high resolution mode. The default for medium resolution is 5/6 and for high resolution is 5/12. This is consistent with the fact that the difference in resolution between these two modes is merely a doubling of resolution in the x-direction. These aspect ratios were designed to give a perfect circle in both cases, but in practice this does not always happen.

In theory, a TV screen has an aspect ratio such that the vertical side is three-quarters the size of the horizontal side. Think of the screen as the lower three-quarters of a big square. With the 320×200 medium resolution mode, this fictitious square is approximately 320×267, which gives an aspect ratio of about 5/6. This is why IBM chose the 5/6 default value in the medium graphics mode.

Different TV sets and monitors will have slightly different aspect ratios. In fact, you can often make adjustments that will change the aspect ratio on a given TV monitor. Thus, no matter what you do, a circle will never appear perfectly round for all displays. The aspect ratio can be adjusted for each site. /PC

In the next excerpt of IBM PC Graphics Primer, you can learn how to make your very own PC-Man, a game that bears a passing resemblance to an arcade favorite. You'll understand some of the secrets of controlling the motion of a character via the power of string manipulation.



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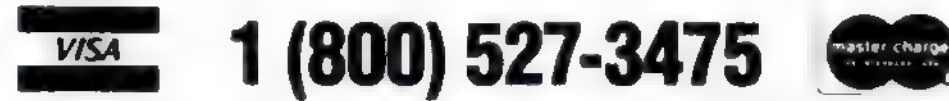
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Follow a novice as he enters a computer store for the first time and buys a PC. Then jump over the counter and read staff writer Paul Somerson's account of his two days as a PC salesman. Next, PC looks into the burgeoning Gray Market and tells how (and why) to rent or lease a PC.

## The Ultimate PC: Five Dream Machines For Every Occasion

How would you configure your PC if there were no limits to what you could spend for peripherals, programs, and panache? PC Magazine describes and illustrates the ultimate configurations for five different applications: a word processing network, the executive suite, a laboratory, a graphic arts atelier, and an attorney's office.

## The Darker Side of DOS 2.0

Eminent computer journalist Peter Norton shares observations from his descent into the unexplored depths of IBM's revised operating system.

## The Configurator

A fold-out chart describing the type and purpose of every peripheral available for the PC.

## PC Reviews

Pascal, Okidata Printers, Lattice C, PC Talk Version 3, SmartCom 2, and much, much more.

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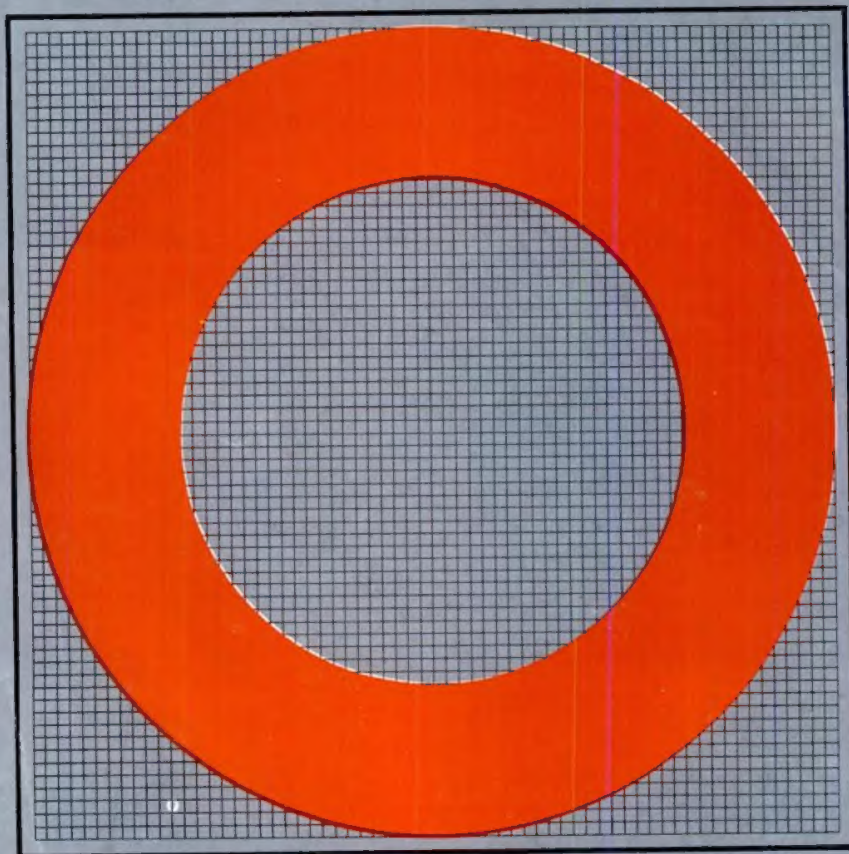
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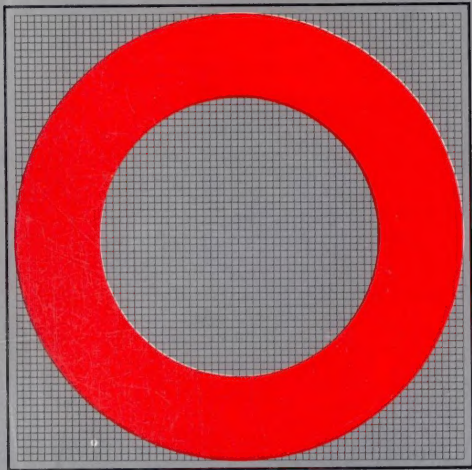
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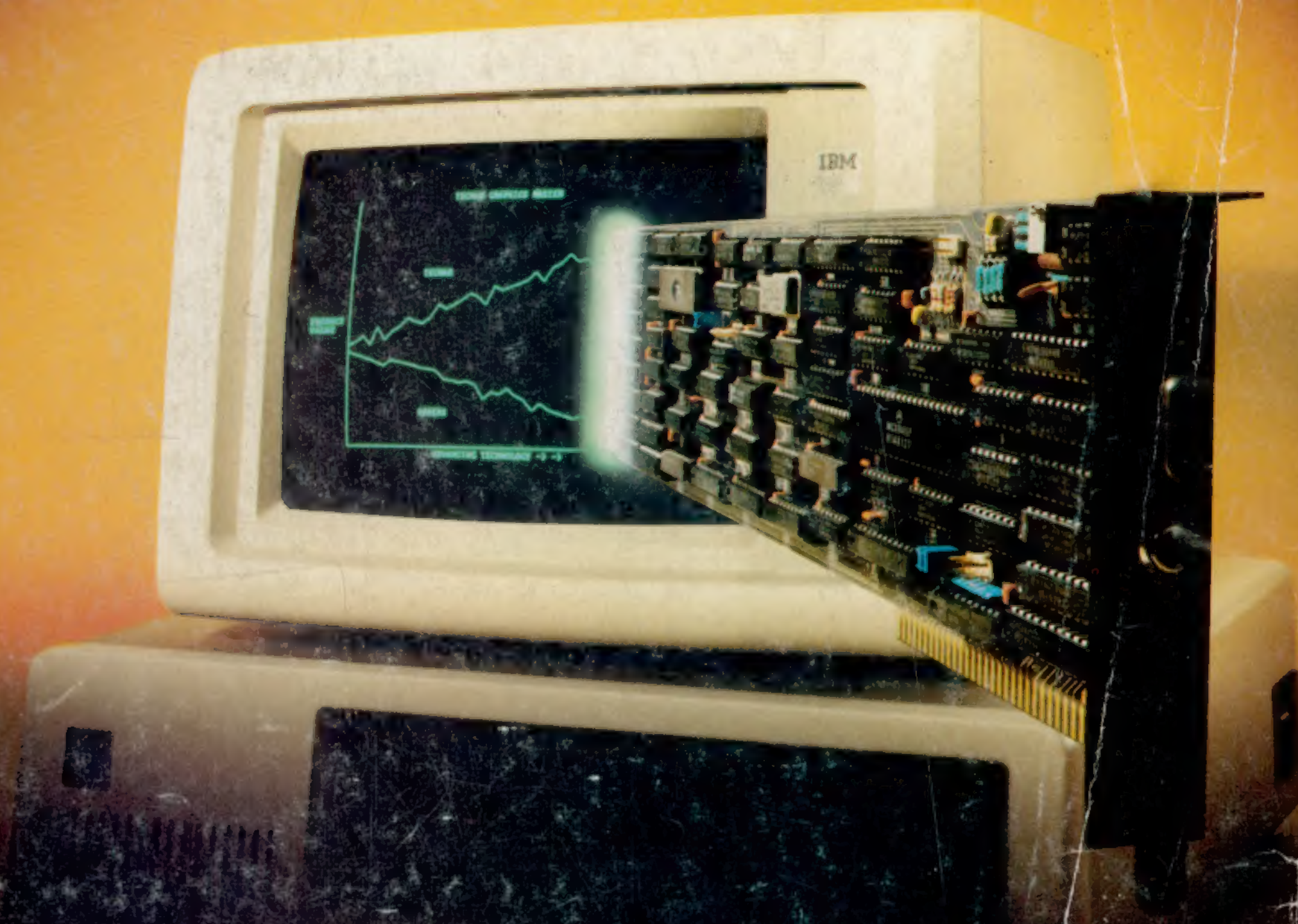
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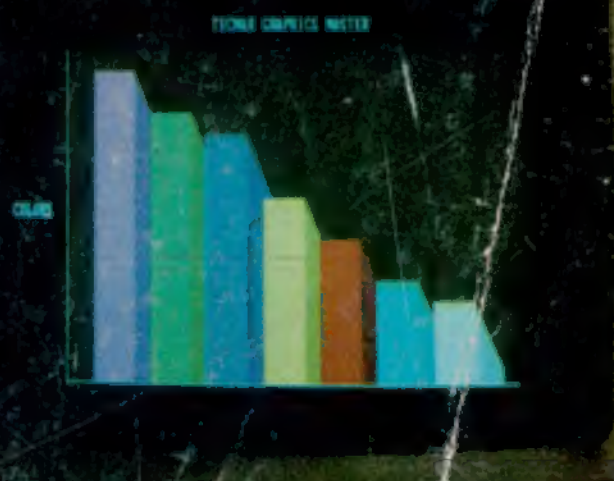
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